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Lectures on the diagnosis and treatment

LECTURES

ON THE

DIAGNOSIS AND TREATMENT

OF

FUNCTIONAL NERVOUS AFFECTIONS.

BY

C. E. BROWN-SÉQUARD, M.D., F.R.S.,

FELLOW OF THE ROYAL COLLEGE OF PHYSICIANS OF LONDON, MEMBER OF THE NATIONAL
ACADEMY OF SCIENCES (U.S.), ETC.

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P R E F A C E.

THE recent immense advances of our knowledge as regards the physiology of the nervous system and the action of remedies, have thrown a great deal of light on the symptoms and treatment of functional nervous affections. Medical practitioners, becoming daily more and more learned in physiology, are now constantly applying the new physiological notions to the practice of their art, and considerable progress in the science and practice of medicine, especially as regards organic and functional nervous affections, has resulted therefrom.¹

The vast field, opened sixteen years ago by the two fundamental experiments on the sympathetic nerve, which show the effects of its paralysis and those of its irritation on blood vessels, and, consequently, on circulation, animal heat, and nutrition, has already been considerably fertilized. Since the time when I first described, in a course of Lectures at the Royal College of Surgeons, of England, the morbid phenomena resulting from a paralysis or an irritation of the vaso-motor nerves, the study of these important phenomena has been pushed forward with great energy and success, by a large number of

¹ A good illustration of the importance of the application of physiology to the practice of medicine has been given by Dr. HOWARD F. DAMON, in his recent very interesting and ingenious work on "The Neuroses of the Skin: their Pathology and Treatment."

physiologists and medical practitioners ; and if there is a fault now as regards the influence of vaso-motor nerves, it is certainly not that too little attention is paid to it, but rather that too many morbid phenomena are ranged under the badly defined title of *vaso-motor neuroses*. Indeed, frequent mistakes are made by many physicians, who attribute to effects of paralysis or irritation of the vaso-motor nerves symptoms which are due to similar alterations of a totally different set of nerves, constituting what should be called *nutritive or secretory neuroses*.

I intend, in these lectures, to give a practical history of the diagnosis and treatment of neuroses, founded upon clinical observation, enlightened by physiology and experimental pathology and therapeutics. The lectures will be grouped into three parts, each of which will form a complete work by itself ; the first part relating to general remarks on the causes, diagnosis, and treatment of neuroses ; the second, to the history of each of the pure functional nervous affections ; the third, to vaso-motor and nutritive neuroses, and to functional nervous affections due to syphilis or to rheumatism, to diseases of the kidneys, the liver, &c., or to alterations of the blood, &c.

The first part, which now appears, will be soon followed by the two others.

C. E. BROWN-SÉQUARD.

CAMBRIDGE, MASS., May, 1868.

PART I.

**PHYSIOLOGICAL PATHOLOGY AND GENERAL THERAPEU-
TICS OF FUNCTIONAL NERVOUS AFFECTIONS.**

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DIAGNOSIS AND TREATMENT
OF
FUNCTIONAL NERVOUS AFFECTIONS.

LECTURE I.

ON THE CAUSES AND DIAGNOSIS OF FUNCTIONAL NERVOUS
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Existence of special conductors for the various kinds of sensations, and for voluntary and involuntary movements of muscles and blood-vessels, &c. — Dilatation of blood-vessels due to nerves of nutrition and secretion. — Variety of effects produced by an irritation of the same centripetal nerve, illustrated by the morbid effects caused by a neuralgia, and by those of an excitation of the skin of the neck by cold air, and of the tickling of the soles of the feet. — Causes of increase of excitability in the various parts of the nervous system. — Extent of the normal and morbid influences of the nervous system on nutrition and secretion. — Three fundamental causes of disease in the various organs. — Diagnosis of functional and organic nervous affections.

GENTLEMEN, — In this and in the next three lectures I intend to call your attention to the most important advances in our knowledge of the causes, the diagnosis, and particularly the treatment, of functional nervous affections, leaving for the succeeding lectures the special study of each of these affections.

I. REMARKS ON THE KINDS OF NERVE-FIBRES, THE IRRITATION OF WHICH MAY PRODUCE NERVOUS AFFECTIONS.

One of the most interesting of the recent advances in Physiology and Pathology consists in the demonstration, that the nervous conductors serving to the following functions — the transmission of the various kinds of sensitive impressions, the reflex phenomena, the conveyance of nervous force to muscles or to blood-vessels, &c. — are absolutely distinct, one from the others, as regards their special function. There is no contradiction between this assertion and the important facts discovered by Messrs. Vulpian and Philipeaux,¹ proving that nerve-fibres are mere conductors, able to transmit nervous force either towards or from the nervous centres; and that the same nerve-fibre may serve to motion or to sensation, when transplanted from one nerve into another. These facts are completely reconciled with the above assertion by the so well-established theory, that the function of nerve-fibres depends, not on peculiar or specific properties of their own, but on the properties and functions of the organs into which they are distributed, and the parts of the nervous centres from which they spring.

Not counting the nerve-fibres of the brain, many of which have functions altogether different from those of other parts of the nervous system, I have ascertained, that, besides the four distinct kinds of nerve-fibres of the higher senses, there are at least eleven distinct kinds of

¹ See the admirable paper of Vulpian and Philipeaux in "Journal de la Physiologie de l'Homme," &c., vol. vi. 1863-65, pp. 421-65 and 474-516.

nerve-fibres in the spinal cord, and in the cranial, spinal, and sympathetic nerves.

The following table shows what are the distinct functions of these eleven kinds of nerve-fibres.¹ They are the —

1. Conductors of impressions of touch.
2. Conductors of impressions of tickling.
3. Conductors of impressions of pain.
4. Conductors of impressions of temperature.
5. Conductors of impressions of muscular contraction (muscular sense).
6. Incito-motor conductors.
7. Incito-nutritive and secretory conductors.
8. Voluntary motor conductors.
9. Involuntary motor conductors.
10. Vaso-motor conductors.
11. Nutritive and secretory conductors.

I hardly need to say, that the number of functionally distinct nerve-fibres is probably much greater than is shown by this table; but the demonstration of the existence of other special kinds of nerve-fibres (such as those serving to the sensations of hunger, of thirst, of pressure, or to voluptuous sensations, &c.) is not yet sufficiently decisive.

¹ I have shown that the nerve-fibres serving to sensations of touch, of tickling, of pain, and of temperature, are not only completely distinct one from the others, but that, after having entered the spinal cord as parts of the posterior roots of the spinal nerves, and after a complete decussation between the fibres of the two sides of the body in that nervous centre, they form in it distinct groups or columns of conductors; so that an alteration, limited to a small part of the spinal cord, may strike either the column for touch, or that for tickling, or one of the other two kinds of conductors of sensitive impressions. I have shown, also, that conductors for the muscular sense differ from the conductors just spoken of in this respect, that they do not decussate in the spinal cord, but that they form also a distinct column in each lateral half of that organ. (See "Journal de la Physiologie de l'Homme," &c., No. 24, 1865, vol. vi. pp. 610-13 and 645.)

Almost all the symptoms of functional (and I might say, also, of organic) nervous affections take place through one or other of three modes of alteration of the properties and functions of the fifteen kinds of conductors above named. These three modes consist in —

1. A diminution or loss of power.
2. An increase of power.
3. A perverted or morbid state, producing a great variety of phenomena.

In the nine kinds of conductors serving to the transmission of sensitive impressions, the first of these three modes of alteration constitutes *anæsthesia*; the second, *hyperæsthesia*; and the third is the cause of *morbid sensations* (including the so-called *referred sensations*).

Without entering into details about the kinds of nerve-fibres which I call incito-motor, incito-nutritive, or secretory, or about those which I simply name nutritive or secretory, I will say a few words concerning their physiological and pathological history.

1. *Incito-motor nerves*. — These are the well-known excito-motor nerves of Marshall Hall. A great many facts prove that they are absolutely distinct from the sensitive nerves. All the reflex movements of the muscles of organic or animal life (including the excretory ducts of glands, the blood-vessels, &c.) originate through an irritation transmitted by these incito-motor nerves to the nervous centres.

2. *Nutritive and secretory nerves*, and *incito-nutritive and secretory nerves*. — Shorter names should perhaps be given to these nerves: but, so long as their real mode

of action remains somewhat doubtful, I think it is better to call them by names which only state what we positively know of them; *i.e.*, that they are agents of modification of secretion and nutrition. The *secretory and nutritive nerves* are in many respects the antagonists of the *vaso-motor nerves*. While these last nerves, when put in action, produce a contraction of blood-vessels, and all the phenomena which I have shown to ensue from that contraction (*i.e.* chiefly a diminution of the quantity of blood, in consequence of which the various vital properties, the secretions and animal heat, diminish also),¹ the nutritive and secretory nerves, on the contrary, when put in action, occasion a dilatation of blood-vessels, and all the phenomena that ensue from it, as shown first by experiments of Czermak and of Cl. Bernard.

I proposed long ago (in my lectures at the College of Surgeons, of London, in 1858)² an explanation of the action of these nerves, which the discovery of several new facts year after year has rendered more and more probable.³ This explanation is, — first, that the secretory and nutritive nerve-fibres act upon the tissues, so as to increase the chemical interchange between them and the blood, and that, in consequence of this increase

¹ See my "Course of Lectures on the Physiology and Pathology of the Central Nervous System," p. 142.

² See Course of Lectures, above quoted, p. 149.

³ The admirable researches made by Ludwig on the salivary secretion (in Henle- and Pfeuffer's "Zeitschrift für Rat. Med.," 1851, vol. i. p. 260), have shown, that, even when the circulation of blood is interrupted, nervous force can be transformed into chemical force in the salivary glands, as an irritation of the nerves of these glands will, for a time after the stoppage of circulation, produce a secretion of saliva.

of chemical activity, much more arterial blood is attracted by the tissues; and, secondly, that this greater afflux of arterial blood causes the dilatation of blood-vessels observed by the various experimenters who have studied this subject. In health, as well as in many morbid states, it is chiefly by a reflex action that this kind of nerve-fibres produce their peculiar effects on nutrition or secretion. The redness, the congestion, of parts attacked with neuralgia, or the neighboring parts; the secretion of tears when the eye is irritated, or the skin of the face pinched; the secretion of mucus from the nasal, laryngeal, tracheal, or bronchial mucous membranes; or the diarrhœa produced by cold; and also an immense number of other instances in which there is a congestion or a secretion as a result of an irritation of cutaneous or other nerve-fibres,—are all effects of the peculiar influence exerted by secretory and nutritive nerve-fibres on glands and other tissues.

These nutritive and secretory nerve-fibres are, as I have tried to prove elsewhere, the agents of production of inflammation, suppuration, and ulceration, by a reflex action. They are the channels of production of meningitis, of encephalitis, or myelitis, when those inflammations are due to cold, to a burn, or to a visceral affection. They also have a great share in the production of many functional nervous affections, and particularly tetanus. Besides, through the agency of these nerves, much may be done for the treatment of nervous affections, as I will show hereafter.

The incito-secretory and nutritive nerve-fibres are the

incident or centripetal nerve-fibres which, by a reflex influence, act upon the centrifugal secretory and nutritive nerve-fibres. Their distinct existence is not fully demonstrated, but many facts render it extremely probable.¹

II. CAUSES OF FUNCTIONAL NERVOUS AFFECTIONS.

The causes of functional nervous affections can be classified as follows:—

1. An irritation (by worms, by teething or decayed teeth, by cold, by a burn), a wound, an inflammation, a neuralgia, &c., of centripetal nerve-fibres (the incito-motor, the incito-nutritive, and some others).
2. An alteration in the quantity or the quality of blood.
3. The co-existence of both the preceding kinds of causes, as in cases of typhus fever, of variola, of diphtheria, of uræmia from disease of the kidneys, of cholesteræmia, &c.

I will not insist here on the mode of action of these causes; but there are a few general remarks which will be in their proper place in this introductory lecture. There are two general rules which particularly deserve attention:—

1. *The same peripheric cause of irritation, acting on the same centripetal nerve, may produce the greatest variety of effects, including every functional nervous affection or disorder.* This is well illustrated by the various

¹ The independent existence of an excito-secretory system of nerves has been assumed, but not proved, by Dr. Henry F. Campbell, of Georgia, and by Marshall Hall. (See Campbell's prize essay in "Transactions of the American Medical Association," vol. x. 1857, p. 465, and his claim to priority in "The Lancet," London, 1857, vol. i. p. 462; and Marshall Hall's paper on the Excito-secretory Sub-system of Nerves, in "The Lancet," London, 1857, vol. i. pp. 2 and 464.)

following effects on the eye of a neuralgia of the infra-or supra-orbitalis nerves. There are such cases showing —

1. Spasm of the sphincter of the pupil.
2. Mydriasis.
3. Spasm of the orbicularis palpebræ.
4. Paralysis of the orbicularis.
5. Paralysis or spasm of one or several of the muscles of the ocular globe.
6. Photophobia.
7. Amblyopia or amaurosis.
8. Congestion or inflammation of the conjunctiva, or of other parts of the eye.
9. Diminution or increase of the secretions of the lachrymal and other glands.
10. Cataract.
11. Glaucoma.¹

Many other examples, less striking, however, might be adduced. I will only mention what we know as regards the effects of cold air on persons coming out of a theatre. One may be attacked with a sore throat, a second with ophthalmia, a third with enteritis, a fourth with nephritis, and many others with any other visceral inflammation. Again, one may be attacked with facial paralysis, and others with almost every other partial paralysis, or with chorea, with contracture, with an inflammation of some parts of the nervous centres or of their meninges. It is true that it is not always the

¹ See the excellent paper of Notta on Neuralgia, in "Archives de Médecine, Juillet, Septembre, et Novembre, 1854;" my work on the "Central Nervous System," p. 157; and the very original dissertation of Rondeau, "Des Affections Oculaires Réflexes," Paris, 1866.

same part of the skin which is submitted to a sudden lowering of its temperature, and that the differences in the nature and in the seat of the reflected morbid effects may sometimes be due to differences in parts of the skin exposed to a draft of air; but in most cases, however, notwithstanding the great variety of morbid effects, it is the same part, *i.e.* the front part of the neck and chest, which is irritated by the cold air.

It is extremely probable, that the considerable variety of morbid phenomena, which follow an irritation of centripetal nerve-fibres, depends almost entirely on differences of excitability of the various parts of the nervous centres in different individuals. I have examined carefully, on a large number of men, the effects of tickling the sole of the foot, and found that these effects differed considerably in different individuals. In some, laughter predominated; in others, involuntary screaming, or shedding of tears, or jerks either only in the irritated limb, or in both lower limbs, or, in a few instances, in the two limbs of one side, or in the four limbs, or a general trembling, or a spasm of the diaphragm, or an almost tetanic rigidity of the irritated limb. I hardly need to add, that, in some individuals, there was no marked effect produced by the tickling, especially when, being prepared for the irritation, they made an effort to prevent its action; a fact which, with many others of similar purport, shows that our will has sometimes the power of preventing the production of reflex phenomena.

2. *The degree of excitability of the various parts of the nervous system not only differs extremely in different persons, but it may increase or decrease considerably in the same person under the influence of many causes.*

This proposition is of so great an importance in the diagnosis and treatment of nervous affections, that it is only by the light it throws on many otherwise very obscure cases that we are enabled to recognize their nature, and to apply to them the proper treatment. Many parts of the nervous system that are completely, or almost completely, inexcitable in a healthy condition, become excitable, and sometimes in a wonderfully high degree, under the influence of several morbid causes. Among these parts, I will point out the grey matter of the spinal cord, and the nerves of the tendons, aponeuroses, dura-mater, periosteum, bowels, bladder, kidneys, and some other viscera. Many causes, very different one from the others, may increase the excitability of the various parts of the nervous system. I will only mention here the principal of these causes:—

1. I have found that muscles, nerves, and the spinal cord, become more excitable after having been laid bare, and especially when the air in contact with them has been rendered richer in oxygen than the ordinary atmospheric air.¹

2. A congestion, and, still more, an inflammation, will produce a great excitability of nervous tissues everywhere, but nowhere so markedly as in the grey matter,

¹ See "Proceedings of the Royal Society," vol. viii. 1857, p. 598; and "Journal de la Physiol. de l'Homme," &c., vol. i. 1858, p. 617.

and some parts of the white columns, of the spinal cord, which, in consequence of this change, will become able to produce referred sensations of pain, of cold or heat, of tickling, &c., and also the phenomena that result from an irritation of motor, vaso-motor, and nutritive nerves.

3. An afflux of blood, such as occurs merely by gravitation, or after a section or a paralysis of the sympathetic nerve, or a lesion of the spinal cord, the medulla oblongata, or the base of the brain, will also increase the excitability of peripheric nerves in the parts where this afflux takes place.

4. Certain remedies or poisons (strychnine particularly) will increase the reflex excitability of the spinal cord to a wonderful degree; while others, such as atropine, will diminish it considerably.

5. Certain diseases, such as tetanus and hydrophobia, will increase extremely the reflex excitability of some parts of the cerebro-spinal axis.

6. A great loss of blood, anæmia, chlorosis, will also increase considerably the reflex excitability of the nervous centres.

The increase of reflex excitability in cases of extreme debility, as in old age, or after a loss of blood, or other causes of insufficient nutrition, would be very difficult to understand, if we did not know that the reflex excitability of the spinal cord can be increased under the influence of certain substances (strychnine principally), when no blood at all remains in the blood-vessels of that nervous centre, as proved beyond the possibility of

doubt by Messrs. Martin-Magron and Buisson.¹ The excitability of sensitive nerves may also be increased when the quantity of blood is much diminished, as we often observe in fingers that have been exposed to cold air or cold water. It seems, from a review of all the facts I know bearing on this point, that certain substances contained in blood altered in quantity or quality will act on the excitability of nerve-fibres in the nervous centres, or in the nervous trunks and branches, so as either to increase it, as is done by strychnine (on the grey matter) and oxygen (everywhere), or to decrease it, as is done by carbonic acid, atropine, &c.

To conclude what I wish now to say on the excitability of nerves, I will only mention,— 1st, That I have ascertained that the excitability of the same nerve varies in different parts of its length, and to such a degree, that, in some parts, the excitability seems nil or is very slight, while in other parts it is considerable; 2d, That I have shown by positive experiments, that the excitability of muscles, of nerves, and of the spinal cord, may be very much increased, while the *force* developed by the action of those parts is very small. For instance, atrophied muscles, unable to contract with half the force shown by healthy muscles, will, however, contract under the influence of an excitation that will produce no effect on healthy muscles.

I will say only a few more words on the causes of functional nervous affections. The important discus-

¹ See "Journal de la Physiologie," &c., vol. ii. 1859, p. 484, and vol. iii. 1860, p. 130.

sions between Virchow, Spiess, and others, on the share of the nervous system in the causation of the various morbid alterations of tissues and organs, have been very useful in bringing forward many interesting facts; but the exclusiveness of the two opposite schools, at the head of which are the eminent men I have just named, has thrown a great deal of obscurity on questions which, considered with less partiality, might have been solved easily. It is certainly true, as maintained by Virchow,¹ that nutrition and secretion, normal and abnormal, can be carried on without the intervention of the nervous system; but this does not at all prove, that that system cannot interfere, for good or for evil, in nutrition and secretion in the various tissues and organs. For instance, there is no doubt whatever, that an inflammation, followed or not by suppuration and ulceration, can take place without any intervention of the nervous system; but there is no doubt also, that the same morbid processes, not only can be, but very frequently are, produced by a nervous agency. Indeed, facts are extremely numerous which establish clearly,—on the one hand, that normal nutrition and secretion do not depend essentially on any kind of interference by the nervous system, and that all morbid changes in these fundamental organic functions can take place without any nervous influence; and, on the other hand, that the nervous system may, and even almost constantly does, influence nutrition and secretion, and that it very

¹ See Dr. Chance's excellent translation of Virchow's "Cellular Pathology," Lect. XIV. London, 1860.

frequently produces, or helps to produce, a great variety of morbid alterations of these two functions.

Not only can an excitation of the same nerve produce effects in the different parts of the nervous centres, in one or another of the viscera, or in distant nerves or muscles or bones, &c. ; but it can also produce, in the same part of the nervous centres, in the same viscus, in the same muscle, &c., different kinds of alteration. Why is there such a variety of alterations produced in one and the same part by an excitation which varies only in intensity? To answer this question, I must go beyond the limits of the subject-matter of these lectures, and cast a glance on the mode of production of morbid affections of the various tissues and organs. Physiology, morbid anatomy, and clinical observation, clearly point out, that all nervous affections (organic and functional), as well as affections of any other part of the body, owe their production to three different fundamental causes :—

1. A special inherent tendency (inherited or not) of the elementary parts of the tissues to become altered in one or in another way.
2. The production or introduction in the blood of those materials which are necessary for the formation of morbid growths, or able, like poisons, to cause alterations of nutrition or secretion.
3. An influence of an excitation from outside, acting with or without the intervention of the nervous system, or a purely nervous influence starting from a peripheric or a central part of the nervous system.

If we keep in mind the truth that these three causes

may exist together and in various degrees, we can easily understand how the same excitation of the same nerve may produce in the same distant part different kinds of alteration of nutrition. It is so that an irritation from a wounded nerve, as I have proved elsewhere,¹ will produce either tetanus or chorea or catalepsy or epilepsy or delirium, &c., and, by a reflex action on a peripheric part, muscular wasting or trembling, a contracture, a neuralgia, &c.

III. GENERAL REMARKS ON THE DIAGNOSIS OF FUNCTIONAL NERVOUS AFFECTIONS COMPARED WITH THAT OF ORGANIC NERVOUS DISEASES.

I now pass to the diagnosis of functional nervous affections, on which subject I will only point out in parallel columns the principal distinctive features of these affections, compared with those of organic nervous diseases.

Characters of Functional Nervous Affections.

1. The principal causes are an alteration of the blood, and an irritation of a part of an incident or centripetal nerve, by a neuralgia, by worms, by teething or decayed teeth, by a wound, a burn, &c.

2. Great variability in the intensity of the symptoms, and regular or irregular recurrence of attacks, with intervals of almost perfect health between these attacks.

Characters of Organic Nervous Diseases.

1. One of the principal causes is a special tendency (inherited or not) to inflammation, to alterations of blood-vessels, or to the formation of morbid growths, etc.

2. Persistence of the principal symptoms, with slow variations in their intensity.

¹ I have given a complete demonstration of the correctness of the above assertion in the article on Diseases of Nerves, in Holmes's "System of Surgery," 1862, vol. iii. p. 876, *et seq.*

3. A sudden or rapid cure or improvement is not rare.

4. Certain symptoms—such as a sensation of pricking, of formication, of burning heat, of icy cold, and other symptoms of irritation of conductors of sensitive impressions, and also alterations of nutrition and secretion of the skin and of mucous membranes and glands (bladder, kidneys, &c.)—are extremely rare, except in a few of these affections (neuralgia, affections due to alterations of blood, &c.)

5. The temperature of the affected parts is generally low.

6. The sphincters of the bladder and rectum are usually normal.

7. An aura, felt or unfelt, very frequently exists in some forms or periods of epilepsy, hysteria, catalepsy, hydrophobia, tetanus, &c.

8. To remove the cause is a fundamental part of the treatment.

3. A sudden or almost sudden cure is impossible, and a rapid improvement is exceedingly rare.

4. Most of the symptoms due to the irritation of conductors of sensitive impressions and of nutritive and secretory nerve-fibres, are constant or extremely frequent in inflammation and even only congestion of the nervous centres or their meninges; and these symptoms are not rare in many other organic nervous diseases.

5. The temperature of the affected parts is generally high.

6. The sphincters of the bladder and rectum are often attacked with spasm or paralysis.

7. An aura, felt or unfelt, never exists except when the organic disease has caused a functional nervous affection.

8. To remove the cause is often impossible, and, when possible, of much less importance than the direct treatment of the structural alterations.

Other means of diagnosis between organic and functional nervous affections have been found within the last few years. As I shall have to speak of them at some length when treating particularly of certain functional nervous disorders, I will merely say here, that the most interesting amongst them are,—

1. The effects of pressure on nerves, as employed by Dr. A. C. Pinel, Dr. Aug. Waller, and Messrs. Bastien and Vulpian.
2. The effects of tickling, and the degree and extent of reflex movements.
3. The influence of galvanic applications.

4. The effects of strychnine as a test for congestion in the spinal cord and its meninges.
5. The existence of anæsthesia limited to a small spot.
6. The alteration in the speed of transmission of sensitive impressions.
7. The existence of an unfelt aura.

LECTURE II.

ON MEANS OF SUPPRESSION OR DIMINUTION OF THE
CAUSES OF FUNCTIONAL NERVOUS AFFECTIONS.

Local applications of narcotics, of ice, and of the actual cautery. — Section of nerves. — Ablation of the clitoris. — Trephining of the cranium. — Ligature of the carotid artery. — Tracheotomy. — Cauterization of the urethra. — Various means of diminishing the reflex excitability of the nervous centres. — Means of producing sleep. — Mode of action of iron in improving nutrition. — Powerful influence of exercise. — Elimination of poisons.

GENTLEMEN, — Great advances have been made within the last ten or fifteen years in the treatment of functional nervous affections. Our progress in that most important branch of medicine has, however, been much greater as regards a more rational or better-appropriated employment of medicines and other modes of treatment, than by the discovery of new remedies. During the same period, there has been also another kind of progress in our therapeutics: it is the rejection of certain modes of treatment, or the limitation of their use to fewer but more proper kinds of cases than previously.

Of the many kinds of advance of our knowledge in the treatment of functional nervous affections, I will group into three classes those which relate to the principal means of suppression or diminution of the causes of nervous disorders. In the first of these classes I

will place various local applications, and different operations on nerves, on arteries, &c. ; in the second will be ranged the means of diminishing the reflex excitability of the nervous centres ; and in the third, I will place means of improvement of blood, and of elimination of morbid and other poisons.

I. ON LOCAL APPLICATIONS AND CERTAIN OPERATIONS EMPLOYED TO SUPPRESS OR DIMINISH THE INTENSITY OF SOME CAUSES OF NEUROSES.

When functional nervous affections are due to an evident irritation of a branch, or of the terminal ramifications of a nerve of a limb, or a superficial nerve of the abdomen or chest, several means of treatment may be successfully employed to check or to cut off the irritation. I will say a few words on the most important of these means.

1. *Local applications of narcotics.*—In cases of epilepsy, of tetanus, of hysteria, and most other functional affections of the nervous system, a wound of the skin or of a branch of a nerve may be the cause of the nervous disorder. Narcotics, and particularly salts of morphia and atropia, employed together, should be applied on the wound itself, in doses varied according to the absence or the abundance of suppuration. An important rule of this mode of treatment is, that the application of narcotics must be frequently renewed, particularly if there is an abundant discharge of pus. If the cause of a functional nervous affection is the division of a large branch or of a trunk of nerve, an

injection of a solution of morphia and atropia should be made at some distance from the wound in the subcutaneous cellular tissue, along the central part of the divided nerve (half a grain of a salt of morphia with one-thirtieth of a grain of a salt of atropia).

2. *Local applications of ice.*— I have long ago pointed out the usefulness of this mode of treatment in cases of wounds producing a functional nervous affection. I will only say here, that when such a means is employed, particularly in a case of tetanus, there should be no interruption in the presence of ice on the wound during the whole of the time that the nervous affection lasts. Billroth has recorded two cases in which traumatic tetanus has appeared, notwithstanding the application of ice on the wound. It is probable, that, in these cases, there has been some interruption in the application of ice.

3. *Application of the actual cautery.*— This means, which may be useful when it is necessary to alter the nature of the secretions in a wound, or to destroy parts of tissues containing a venom, has not generally so much value as either the preceding or the following modes of treatment.

4. *Various applications on the trunk of nerves at some distance from a wound.*— It may be useful to lay bare the nerve that gives filaments to the wounded part, and to apply sulphuric ether or narcotic alkaloids or ice upon it. In cases in which there is reason to expect that the original wound will soon heal, this mode of treatment might prove useful.

5. *Section of a nerve.*—The number of cases of epilepsy, of tetanus, and of other nervous complaints, due to a wound, a burn, &c., in which this mode of treatment has proved quite successful, is now so large, that there is no doubt as regards its immense value. It is most important to know that the operation must be performed early, as its chances of success decrease rapidly with the prolongation of functional nervous affections produced by a wound, a burn, or some other peripheric causes of irritation. It is necessary, not only to divide the nerve completely, but to take away a small part of its peripheric end, which is to be examined carefully with the microscope to ascertain whether it is altered or not. If it is found inflamed, or otherwise altered, the operation must be repeated, whenever possible, on the same nerve, much nearer the spine or the cranium. The microscopical examination of a small part of the nerve extirpated in this second operation, will prove very important for the prognosis of the case. The fact, that a paralysis is a necessary result of the section of a nerve, can hardly be an objection against its performance in affections like epilepsy, tetanus, hydrophobia, &c. Indeed, no sane man can have the least hesitation between these two things: on the one hand, an almost certain death, or the persistence of a fearful affection, which may produce imbecility; and, on the other hand, a paralysis of motion and sensation in a part, or even the whole, of a limb. And the hesitation, if any can exist, would certainly give way to the knowledge, that the ends of a divided nerve, even when a small part has been ex-

cised, will often unite soon, or within a year, and the paralysis be cured more or less completely. The rapidity of re-union of the ends of a divided nerve may be so great, that in a few weeks, and even sooner, there may be a partial return of function, as shown by cases reported by Mr. J. Paget¹ and by Mr. Syme.² As regards the completeness of the return of the vital properties in a divided nerve, I have seen that it may be as perfect as possible, particularly in the case of a nobleman, on whom Sir William Fergusson had divided the infra-orbitalis for a neuralgia.

6. *Operations on the genital organs.*—An able English surgeon has lately treated several kinds of functional nervous affections by the extirpation of the clitoris. That this operation may sometimes be useful, there is no doubt at all.³ But I cannot look upon this mode of treatment as one that should be employed in other cases than those in which a distinct aura starts from the clitoris, or in those cases in which that organ is morbidly sensitive and much hypertrophied. There are on record cases of nervous complaints, due to masturbation, in which the clitoris has been extirpated without any durable benefit as regards the nervous affection, or even as regards the habit of masturbation. In women, as well as in men, the only usually decisive means against masturbation is the production of a

¹ See "Lectures on Surgical Pathology," by James Paget, Lect. xii.

² See "Treatise on the Excision of Diseased Joints," by Prof. Syme, p. 88.

³ I will, on this point, refer to a good paper recently published by Dr. H. R. Storer, in which he advances views very similar to my own as regards the frequency of onanism in women, and its treatment. See "The Western Journal of Medicine," of Indianapolis, for 1867, vol. ii. p. 440.

small ulcer (by caustics or the red iron) on parts of the genital organs that are unavoidably touched or moved in the act of self-abuse, so that every attempt to accomplish the act, either with or without the help of the hand, is so painful that the patient must give it up. Even this means, however, does not always prevent onanism. Indeed, I have seen a case in which the mere touch of the glans (which was inflamed and covered with pus) made the patient scream from the intensity of the pain, and in which, however, masturbation was practised several times a day.

As regards the removal of the testicles, it seems to me a barbarous operation, if performed only because there is an excessive tendency to sexual intercourse.

7. *Trephining of the cranium.* — As a mode of treatment against epilepsy, this operation has been much more frequently performed than is generally known. It has also been made, and with success, by Professor E. Geddings, of Charleston, in a case of tetanus, due to an irritation of the dura mater by a broken piece of bone.¹ Trephining of the cranium has also been successfully performed by Mr. Henry Lee, of London, in a case of reflex ulceration of the skin of the arm and spasmodic movements of the same limb.² It would be out of place here to discuss fully the question of the usefulness of that dangerous operation as a means of treatment of epilepsy. I will merely say, that it is only in cases of an irritation of the dura mater, by a broken

¹ See "The American Journal of the Medical Sciences," Jan., 1853, p. 272.

² See Dr. Beale's "Archives of Medicine," 1860, p. 90.

piece of bone, by diseased bone, or any other evident organic cause, that trephining can rationally be performed; and that, even in such cases, a cure might be obtained (and has really been sometimes obtained) by the use of counter-irritation applied on the diseased spot.

8. *Ligature of the carotid artery.* — This most irrational mode of treatment is, or I hope will soon be, completely abandoned. It has been employed in epilepsy and in mania, with the view that those affections depend on a congestion of the brain, and that a ligature round the carotid artery would diminish that congestion. I will show, in a new edition of my work on "Epilepsy," that the good effects of this operation, in the cases of Preston and his imitators, have been obtained chiefly through some injury to the cervical sympathetic nerve.

9. *Other operations for the removal of causes of functional nervous affections.* — I will only point out the importance of the removal or expulsion of a decayed tooth, of a tumor, of a carious or necrosed bone, or of worms in the bowels or vagina, in those cases in which there is a probability that these sources of irritation are the principal causes of a nervous complaint. Of other operations, such as tracheotomy and the cauterization of the urethra, I will only say a few words. It is now perfectly established, that the theory of epilepsy given by Marshall Hall was wrong; and that, if tracheotomy may be useful in some cases of epileptic coma, or spasm of the glottis, in tetanus, in hydrophobia, or in whooping-cough, &c., this operation in those cases is of service

against an effect, and not against a cause, of the existing nervous affection. As regards the cauterization of the urethra, according to Lallemand's plan, in cases of nervous complaints due to seminal losses, I must say, that I have been consulted by a great many patients who had vainly submitted themselves to that operation; while I have often observed a considerable amelioration, and sometimes a cure, by a medicinal and hygienic treatment, consisting in the use of atropine, the ergot of rye, large doses of the bromide of potassium, and nervine tonics,—such as quinine, iron, manganese, silver,—with cold, shower, and sitz baths, gymnastic exercise, and the most nourishing alimentation.

10. *Treatment against visceral diseases.* — I only wish to point out under this head, that every organ, or part of an organ, in so far as it has nerves, and also if it has any marked influence on the composition of the blood, can be the cause of a functional nervous affection. Therefore an alteration of such an organ must be energetically fought against in these nervous affections, particularly when no other cause of it can be found but that alteration.

II. MEANS OF DIMINISHING THE REFLEX EXCITABILITY OF THE NERVOUS CENTRES.

An increase of the reflex excitability of some part of the nervous centres is one of the most important elements of many neuroses, and particularly epilepsy, hysteria, tetanus, hydrophobia, delirium tremens, chorea, paralysis agitans, and some forms of reflex insanity.

To diminish that increase of reflex excitability is an essential part of the treatment in those affections. The following remedial agents are to be employed against this morbid state: —

1. Codeine, narceine, morphine, atropine, valerian, aconite, the chloride of barium, the bromidé of potassium, the bromide of ammonium, and turpentine, are undoubtedly the most reliable remedies against an increased reflex excitability. According to the kind of nervous affection, and also to the seat of the increase of that vital property, we are to select either one or another of these remedies. Atropine, valerian, and the bromides of potassium and of ammonium, are the most valuable in epilepsy; the chloride of barium is of real value against tetanus and paralysis agitans, but of no use in the common forms of epilepsy; codeine, narceine, morphine, and valerian are useful against hysteria, &c. None of these remedies, however, equals chloroform; but, unfortunately, its influence is merely transitory. Counter-irritants and the warm bath have also a great power against the increased reflex excitability, as I will show in another lecture.

2. As a morbidly increased excitability is very often due to anæmia or to an impoverished nutrition, all the hygienic and medical means (good food, exercise, and tonics) that can improve nutrition should be ordered in such cases against that morbid state.

3. It is of the utmost importance to improve sleep, which is generally very bad in patients attacked with a morbid increase of the reflex excitability. For this pur-

pose, an invaluable remedy has recently been discovered: it is the bromide of potassium. Excepting when pain is one of the causes preventing sleep (in which case the alkaloids of opium, aconite, or hyoscyamus should be employed), I have found that this remedy has a most wonderful power to produce a quiet and refreshing sleep, without any drawback that I am aware of.¹ I usually give to adults a dose of thirty grains of that salt a quarter of an hour before the last meal, and a second dose of from thirty to fifty grains at bed-time. In cases in which, without any nervous complaint, there is sleeplessness, owing to some cause of cerebral excitement, as well as in all neuroses, excepting hydrophobia, tetanus, very severe cases of delirium tremens, and some forms of insanity, I have ascertained that a sound and refreshing sleep is almost always induced by that remedy. In some cases, I have found it necessary to increase the dose of the bromide, and to give also a small dose of narceine or codeine an hour before bed-time. In those affections in which the bromide of potassium is not powerful enough as a sleep-inducing agent, a warm bath of four, five, or six hours' duration, is often successful.

III. IMPROVEMENT OF THE BLOOD, AND ELIMINATION OF CERTAIN POISONS.

It is now well known that all the morbid states of the blood can produce functional nervous affections. I,

¹ See Dr. H. Behrend's paper on this subject in "The Lancet" for 1864, vol. i. p. 607. — Dr. B. himself was attacked with sleeplessness, and was quickly cured, under my advice, by the use of the bromide of potassium.

therefore, need not stop long to prove, that anæmia, or the presence of morbid or other poisons in that liquid, often engender the worst as well as the slighter forms of nervous disorders. Since the publication of Marshall Hall's views on the effects of loss of blood,¹ we have learned much as regards the influence of anæmia in the production of nervous affections. In an admirable and too little-known work of the late lamented Dr. O. Landry,² cases are recorded, showing how various are the forms of nervous disorders caused by an insufficiency of the amount of blood in the system, or by an alteration in the qualities of that nutritive fluid. The various forms of insanity, paralysis of sensibility or motion, neuralgia, and almost all the convulsive affections, from chorea to epilepsy and catalepsy, are among the often-observed effects of anæmia, whether due to a loss of blood, or to other causes. I must, however, warn the student of the physiology and pathology of the nervous system against admitting, that the convulsions observed at the time of impending death from hæmorrhage are to be considered as a genuine epileptic fit. Kussmaul and Tenner³ have committed a great mistake, in admitting that the fits they observed in their interesting experiments on animals were epileptic fits. The convulsions in those animals, as in our own species in similar circumstances, *i.e.*

¹ See his "Essay on the Hydrocephaloid Disease in Children," and his "Observations on the Due Administration of Bloodletting, and on the Curative Effects of the Loss of Blood."

² "Recherches sur les Causes et les Indications Curatives des Maladies Nerveuses," Paris, 1855.

³ See the translation of their work "On Epileptiform Convulsions from Hæmorrhage," published by the New Sydenham Society, 1859, vol. v. pp. 1 to 109.

occurring immediately after a considerable loss of blood, are due, as I will prove in another lecture, to the irritation of the nervous centres by the carbonic acid which then accumulates in the blood that remains in the system. In other words, convulsions are then due to asphyxia, and not to an alteration of nutrition, which cannot take place in a few minutes.

There is no general rule of treatment against the various morbid states of the blood, producing nervous affections, beyond this self-evident one, that the best means to improve the condition of that fluid should be employed, together with the special means of treatment of the particular nervous affection caused by the morbid condition of the blood. Anæmia, rheumatism, gout, diphtheria, scarlatina, syphilis, &c., are to be treated in the same way, whether they are or not the causes of a functional or organic nervous affection.

I will only make a few more remarks on this subject. Modes of treatment consisting in attempts to furnish to the blood substances which are deficient in quantity, either in that fluid itself or in the tissues (such as iron in cases of chlorosis and anæmia, or phosphorus in certain nervous affections, and in cases of seminal losses), or to prevent certain secretions (as that of sugar in diabetes), are gradually being replaced by sounder therapeutic principles, grounded on a better knowledge of the causes of the alterations of the blood, or of nutrition and secretion, and also on a better appreciation of the immense value of hygienic means to improve the condition of the blood, and of the great organic functions. For instance,

it has been shown by Sandras, Dalpiaz, Becquerel, Eismann, and others, that chlorosis is a nervous affection; and that the deficiency of iron in the blood of chlorotic patients is an effect instead of a cause, as this deficiency occurs only after this affection has existed some time. It has been further shown, that iron serves to cure that affection, chiefly on account of a peculiar influence which causes the food to be transformed more easily into blood, and probably, also, of a direct improvement in the nutrition of the nervous centres. Other metals, which are not normal constituents of blood-globules, especially manganese and silver (particularly the oxides of these metals), sometimes act better than iron in cases of chlorosis and anæmia. He who will read attentively the remarkable papers of Professor Bouchardat on the pugilist's training, and on the rapidly curative effect of exercise and good food in diabetes,¹ will soon be convinced of the immense value of purely hygienic means in improving nutrition and secretion. It is quite natural, therefore, that gradually the idea is being abandoned, that, whenever a principle is diminished in quantity in the blood or in the tissues, the best treatment consists in trying to increase its amount by giving as a remedy the deficient substance. Consequently the selection of a remedy as a tonic or a stimulant ought to be quite independent of any such chemical view; and we ought to let a good diet, and all the principal rules of hygiene,

¹ See "Supplément à l'Annuaire de Thérapeutique pour 1861," and the paper on the "Treatment of Diabetes," pp. 291-336, in "L'Annuaire de Thérapeutique pour 1865."

take care of the composition of the blood, when its morbid condition consists only in the deficiency of globules or albumen,—remembering, however, that it may be useful to the patient to employ the kinds of food which we know to contain, in easily absorbable forms, iron, phosphorus, or some other substance which seems to be in insufficient quantity in the blood or in the tissues.

As regards the elimination of mineral poisons which have produced functional nervous affections, I will only say at present, that the discovery of Melsens, which shows the value of large doses of the iodide of potassium for the expulsion of lead and mercury from the system, has been universally recognized. It is important to remember, that the dose of that salt must be very large for its successful influence. The statements of Melsens and N. Guillot on this point have received positive confirmation from researches by Dr. W. Budd, of Bristol, and Professor Easton, of Glasgow.¹ My own observations agree with the conclusions of these able physicians. The elimination of lead and mercury takes place chiefly by the urinary, salivary, and cutaneous secretions. Consequently, saliva must be spit, and the skin very frequently washed, in order to avoid a partial absorption of these poisons after they have been secreted.

¹ In a second paper, Melsens says, that, at first, the dose should be small, to avoid the solution of too great a quantity of lead or mercury, which might prove injurious. I do not agree with him on this point; but I think, that the doses, however, should not be as large at first as after a few days. I think also, that, instead of two or three doses a day, five or six should be given, in those special cases of nervous affections due to lead or mercury. See Melsens's second paper in "Journal de Chimie Médicale," 1849, p. 186; W. Budd's paper in "British and Foreign Medico-Chirurgical Review," 1853, vol. xi. p. 202; and J. A. Easton's paper on Elimination, in "Glasgow Medical Journal," July, 1858, p. 152.

I will not speak of the elimination of morbid poisons (such as those of diphtheria, rheumatism, gout, syphilis, leprosy, &c.) having produced nervous affections, because nothing of great importance has been found recently that applies to all, or almost all, those poisons. The only fact worth mentioning is, that the iodide of potassium may serve for the elimination of all but one of them.

LECTURE III.

ON MORAL, PHYSICAL, AND VARIOUS OTHER MODES OF TREATMENT OF FUNCTIONAL NERVOUS AFFECTIONS.

Importance of a serious mental occupation. — Means of increasing and of decreasing the quantity of blood in the limbs, the trunk, or the head. — Irritation of nerves of the skin and other peripheric parts, as a means of curing a morbid state of the nervous centres. — Therapeutic use of cold and heat. — Cauterization of fauces and larynx. — Baths. — Pressure on the carotid artery. — Special treatment of periodical affections. — Special use of anæsthetics.

GENTLEMEN, — I will divide the subject of this lecture into six parts: the first, on moral treatment; the second, on physical and mechanical means of treatment; the third, on therapeutic means, acting through an irritation of sensitive and other incident nerves; the fourth, on complex modes of treatment, combining the two processes of irritation of nerves and a modification of blood; the fifth, on special modes of treatment in periodical nervous affections; and the sixth, on a special use of anæsthetics.

I. MORAL MEANS OF TREATMENT.

Under this head I will say only a few words here concerning two general principles of therapeutics, which, notwithstanding their importance, are very much neglected. The first of these principles, so well established

by the researches of Dr. Cerise,¹ is, that a *serious aim* in the daily occupations is of the greatest value, and, for many persons, quite essential to prevent or to check nervous disturbances. The applications of this principle are, of course, very difficult, and often impossible, in certain neuroses; but in those cases in which any kind of serious work, either mental or physical, but not too fatiguing or exciting, is liked by the patient, he should be induced to do it. In cases of hypochondria, of hysteria, of chorea, and even of epilepsy, a great benefit can be derived from a serious employment of the mental and physical activity of the sufferer. How often have I not seen young epileptics kept in idleness (alas! by medical advice), and, having gained more or less of the vices it leads to, improve rapidly from having their minds occupied at regular hours, in nearly the same way as healthy people of their age!

The second principle of moral treatment is, that we must, in the interest of our nervous patients, as much as, if not more than, in our own, give them confidence and hope in the treatment we recommend. In hysterical and all nervous complaints allied with it, and also in hypochondria, and in several other neuroses, a great hope of cure will do much to work out the cure. No doubt you will say, How to give hope? I answer, that the best means for that purpose is to have hope ourselves, and to express our hope with the accent of conviction. And as you would ask, How can we command

¹ See his excellent work, "Des Fonctions et des Maladies Nerveuses," Paris, 1842.

hope in ourselves? I answer, that the very knowledge of the truth of the principle I am now speaking of is enough to render one hopeful. I need not repeat, that I am now speaking only of those neuroses in which the power of the mind upon the body is so great, that under the influence of an emotion, or another moral cause, a sudden or almost sudden cure is not very rare.

II. PHYSICAL AND MECHANICAL MEANS OF TREATMENT.

Although the therapeutic means of this class are not very new, most of them are so generally neglected, notwithstanding their great value, that I must say a few words about them, especially to show in what way and in what cases they should be employed.

1. *Means of increasing the quantity of blood in peripheral parts of the body.*—In all cases of diminution of size and density in muscles attacked with reflex paralysis, lead palsy, paralysis agitans, rheumatic paralysis, or idiopathic and reflex wasting palsy, as well as in cases of anæsthesia with diminished temperature of the skin, it is very useful to increase the quantity of blood in the paralyzed, the trembling, or the anæsthetic parts. For this purpose, the best mechanical and physical means are the following:—

1. When the affected part is not extensive, dry-cupping, with the ordinary apparatuses, may be resorted to with advantage, particularly in cases of local hysterical anæsthesia, with great coldness of the skin.

2. Junod's boots to be applied every other day, either to a whole arm or to a whole lower limb, when there is

no œdema. It is chiefly in cases of paralysis, with wasting of muscles (not, however, the idiopathic wasting palsy), when the loss of motion is not due to an organic disease of the nervous system, that I have witnessed a great amelioration from the use of this powerful means of increasing the amount of blood in a limb. As regards the *modus agendi* of that therapeutic means, I have ascertained, by experiments on animals, that muscular irritability increases whenever the quantity of blood is augmented in muscles; and I have found, that, in a limb of an animal dry-cupped for eight or ten minutes by Junod's boot, muscular irritability acquires a much greater degree than before the application of the boot.

3. Covering the affected part with heated flannel or woollen stocking or sleeve.

4. Shampooing, without uncovering the part, if the temperature of the room is low.

5. Frictions with a hot piece of flannel only in the direction of the venous current.

6. The affected part should be kept as much as possible in a lower position than that of the rest of the body.

7. Applications of ice should also be made, according to rules to be given hereafter.

2. *Means of diminishing the quantity of blood in the trunk and head without bleeding.* — It may be necessary to employ means of this kind in the comatose state existing sometimes in certain functional nervous affections, such as epilepsy, eclampsia, delirium tremens,

or in nervous disorders due to uræmia, cholesteræmia, or some other kind of toxæmia. Junod's boots may answer the purpose; but there is a simpler means, which has the great advantage of being everywhere at hand, and is superior to these cupping boots in this respect also, that it may be applied with hardly any interruption for hours and days, if necessary. This means consists in the application, on the upper part of the four limbs, of ligatures tight enough to diminish considerably the return of blood to the heart, without preventing much the arrival of blood. By so doing, a pretty large amount of blood may be imprisoned in the limbs, and all the immediate benefits of bleeding can be obtained; while the bad effects it may have exist only during the time the ligatures are kept on the limbs. In making use of this means, it is important to loosen the ligatures every fifteen or twenty minutes, and to apply them in a new place after each loosening. To avoid the danger of a sudden return of a great deal of blood, they must be removed successively, and an interval of at least a few minutes must be left between two succeeding removals.

3. *Means of increasing the amount of blood in the trunk and head.* — It may prove necessary, or at least useful, in some cases of syncope (in hysteria, in epilepsy, and in a few other neuroses due to anæmia, chlorosis, &c.), to increase the amount of blood in the trunk. In addition to the so-well-known means of laying the patient flat on his back, his head left on the level of his body, and his four limbs lifted up, so as to have the help

of gravitation for the accumulation of blood in the trunk and head, it seems of real importance to press with the hand or with a tourniquet on the main arteries of the four limbs, near their place of issue from the trunk. Besides these means, it is of great importance to excite the heart to beat by frequently repeated pressure on the sternum and ribs directly over that weakened organ; as I have ascertained, on various species of animals, that when the movements of the heart have just ceased, in consequence either of a reflex action from an irritation of the abdominal sympathetic nerve, or of a direct excitation of the medulla oblongata or par vagum, a pressure upon that organ (*i.e.* a direct mechanical stimulation) will make it beat again.¹

4. *Other mechanical and physical means.* — I will not speak now of the pressure on the carotid arteries, or on nerves, as these means are not simply mechanical. The same reason makes me postpone what I have to say of the application of ligatures round a limb or some other part, in cases of an *aura epileptica* or *hysterica*, &c. I will now say only, that when an attack of epilepsy, of eclampsia, &c., is followed by a comatose state, or even a sleep with heavy breathing, it is of the greatest importance to place the head of the patient in such a position, that the tongue, which is then nearly paralyzed, will not fall on the larynx, and cover its aperture.

¹ There is a most powerful means of exciting the heart to beat in cases of partial syncope, which I do not mention in the text, because it is not mechanical. It consists in stopping completely the breathing of the patient for one-half or two-thirds of a minute. The blood then becomes more charged with carbonic acid, and more exciting to the heart.

III. ON THERAPEUTIC MEANS, ACTING THROUGH AN IRRITATION OF THE SENSITIVE AND OTHER INCIDENT NERVES.

These means are of the utmost value ; and the recent progress of our knowledge, as regards their mode of action constitutes a large part of the advance of the therapeutics of neuroses in our time. These means act chiefly by a reflex action ; most of them on the vaso-motor nerves, and some of them on the nutritive and secretory nerves. Many of them give a sensation of pain, while they are applied or afterwards ; but most likely their principal mode of action is through the irritation of the non-sensitive incident nerves (excitomotor of blood-vessels, and excito-nutritive and secretory nerves). I will state briefly what are the most interesting points concerning the therapeutic influence of these means.

1. *Ligatures, pinching, rubbing, and circular blisters.* — When I first began to make use of ligatures in epilepsy, I had hardly any other than theoretical objections against the view, that, in that convulsive affection, ligatures serve only to prevent the passage upwards of an irritation travelling from the periphery towards the nervous centres. I soon saw several cases similar to a few already known, in which the cause of the aura was clearly in the nervous centres, and in which, however, ligatures acted as marvellously in preventing attacks as in cases in which an aura had undoubtedly its cause in a peripheric part.

When the extremely various sensations which accom-

pany an aura,¹ in the same manner as the aura itself, have their only cause in the nervous centres, as it was in the cases I have just mentioned, it is quite evident that there is nothing going from the periphery to the nervous centres; and it is quite as evident, that ligatures in such cases must act by some other means than by preventing the passage of something. This first point being clearly established, I found that ligatures, in cases of an aura having a centric origin, acted with greater efficacy when they suddenly produced powerful irritation of the nerves of the skin, than when they were applied gradually and slowly, either tightly or not. After having made this step, I ascertained that it was so even in cases of an aura starting distinctly from the periphery. I found afterwards, that, in both kinds of cases, pinching, pricking, striking, or rubbing the part which is objectively or only subjectively the place of origin of an aura may prevent a fit of epilepsy or of hysteria, or simply of local or general convulsions. I was led, therefore, to look upon ligatures in those cases as acting chiefly as a means of irritation of the nerves of the parts on which they are applied,—an irritation producing a favorable change in the nervous centres.² The following results I have subsequently obtained:—

¹ I say, "accompany an aura," because I have found that the sensations which are misnamed *aura* are not at all essential, as they vary extremely, and may exist or be absent altogether; the *aura*, notwithstanding their absence, being as powerful as any *apparently felt aura* can be. These sensations, therefore, which are erroneously considered as constituting the *aura*, are merely accidental phenomena which accompany the essential and special irritation which should alone be called *aura*.

² The influence of an external irritation in producing a favorable change in the nervous centres is beautifully illustrated in cases of myelitis existing in a

1. That it is not necessary to apply an irritation (by a ligature, pinching, &c.) on the very limb from which an aura seems to start, as the same means applied elsewhere may succeed; but the chance of success is much greater by the former than by the latter way.

2. That a constant or a frequent irritation (by a blister, an issue, a seton, the actual cautery, &c.) on the place from which an aura seems to start, may not only prevent fits, but, by some change of nutrition locally (if the aura is really of peripheric origin) and in the nervous centres, may reduce or even destroy altogether the tendency to fits, and lead to a complete cure.

3. That, as a circular ligature may procure a temporary good effect, so a narrow *circular blister* applied all round a limb, a toe, or a finger, or a circular cauterization with a white-hot iron, may cure epilepsy, hysteria, neuralgia, &c., in cases with a distinct aura.

4. That, even in cases in which there is no known aura, felt or unfelt, ligatures, pinching, and other means of irritation, may prevent the occurring of expected fits. I ought to say, in addition, that, for a long while already, it has been known, — not generally, however, — that lig-

small zone, in the upper or middle part of the dorsal region, leaving below it all or nearly all the dorso-lumbar enlargement of the spinal cord in a very congested but probably otherwise healthy state. In seven well-characterized cases of that kind that I have seen (alone or with Professors Trousseau and Nélaton, and Drs. Charcot and Verneuil, of Paris, J. S. Ramskill and Hughlings Jackson, of London, and Dr. L. R. Stone, of Newton, Mass.), there were, as usual in such cases, extremely violent and frequent reflex tetanic spasms in the lower limbs. In these seven patients, the spasms at once abated and quickly ceased, when the big toe of either of the feet was seized, and forcibly and suddenly drawn down, flexed as much as the ligaments of the joints would allow. I think the same means should be tried in tetanus, and particularly traumatic tetanus.

atures, applied to one or two limbs, may prevent the appearance of an expected attack of fever and ague. As malarial poison produces fever by a peculiar influence upon the spinal cord, the success of ligatures against fever and ague is probably due to a favorable change in that nervous centre, induced by a peripheric irritation of incident nerves.

2. *Cold.*—Ice is the most powerful means we possess to produce a reflex contraction of blood-vessels. Before a positive demonstration was obtained, this mode of action had already been rendered extremely probable, by the following well-known facts: that ice applied on the abdomen or on the back, or in the vagina and rectum, often stops a hæmorrhage from the womb; that, applied to the head, it will do some good in cases of congestion or inflammation of the brain or its meninges, or in cases of symptomatic or idiopathic headache; that it may stop a hæmoptysis when applied to the chest, and a hæmorrhage from the bowels, the stomach, or the kidneys, when applied to the abdomen or the loins; that it may be employed with marked benefit against an inflammation of the viscera or serous membranes of the chest and abdomen, and especially against puerperal fever and metroperitonitis, as shown particularly by Michaëlis of Kiel, T. Helm, F. Kiwisch;¹ that, applied all along the spine, it may cure tetanus, and be useful against spinal meningitis.²

¹ See "The British and Foreign Medical Review" for 1837, vol. iv. p. 518; and for 1842, vol. xiii. pp. 103 and 120.

² The above facts have led me to propose ("Lectures on the Various Forms of Paralysis of the Lower Extremities," 1861, pp. 91, 92) the use of pounded ice,

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These facts gave a great probability to the view that ice acts as an irritant of incident nerves, and, through the influence of this irritation transmitted to the spinal cord or to the base of the brain, produces a reflex contraction of blood-vessels; but, so far as I know, there was no positive fact demonstrating this peculiar mode of action of cold on blood-vessels, until the experiments which I made more than sixteen years ago,¹ with my friend Dr. Tholozan, clearly showed that ice can act in that way. We found that dipping one hand into water at freezing-point produces in the other hand considerable contraction of blood-vessels and a corresponding diminution of temperature. This fact, of which I shall have to speak again in another lecture, leaves hardly a doubt as regards the mode of action of ice in the cases in which it is daily employed with the view of producing a remote effect. Recently, Dr. Chapman² has had the idea of applying ice to the spine, with the purpose of paralyzing the vaso-motor nerves of the limbs or of the head. He states that the application of ice to the lumbar region of the spine produces a dilatation of the blood-vessels of the lower extremities, and all the consequences of a greater afflux of blood; and that a similar application between the shoulders produces the effects of the section of the two cervical sympathetic nerves. Whether he be right or

to be applied in bladders all along the spine in cases of hæmorrhage in the spinal canal. I have since then made a useful application of this mode of treatment in a case of that kind.

¹ See "Journal de la Physiologie de l'Homme et des Animaux" for 1858, vol. i. p. 497.

² Medical Times and Gazette, July 18, 1863.

wrong in his explanations, he at any rate relates facts which deserve to attract the attention of the profession. We are not frequently enough successful in our treatment of neuroses to neglect means which, according to his statements, have cured so many cases of epilepsy or of other nervous affections. It is to be hoped, therefore, that physicians having charge of large hospitals will give a fair trial to the means he proposes, and ascertain the real value of cold applications to the spine in the treatment of neuroses.

I will try to prove elsewhere, that the application of ice to the upper part of the spine chiefly acts like any other irritation of the skin, but with more power; modifying remedially the nutrition of the nervous centres, and particularly that of the base of the brain. A reflex influence on the circulation of blood and on the nutrition of the retina may also take place from the application of ice to the spine. A patient of Mr. Ernest Hart¹ has been cured of epilepsy and progressive atrophy of the optic nerve by applications of Chapman's ice-bags to her spine. The same patient had previously been under my care, and had derived only a slight benefit from the use of the valerianate of atropia.

I wish it to be understood, however, that I do not recommend the use of Chapman's India-rubber ice-bags. I believe, that, in most cases in which ice is to be applied, its influence is very much diminished by the interposition, between it and the skin, of a pretty thick layer of India-rubber. In cases of congestion of the base of

¹ See "The Lancet," London, January, 1865, vol. i. p. 6.

the brain or of the cerebral meninges, pounded ice must be applied almost on the bare skin, a thin linen only being placed between ice and the cutaneous surface. The same mode of application is also the proper one in cases of great coldness of feet in epilepsy, in hysteria, and also in cases of infantile paralysis and in lead palsy, and several other kinds of paralysis in adults. I have ascertained, that, in all these cases, rubbing with ice the skin of the legs, feet, arms, and hands, each part for ten minutes every day, very quickly improves circulation and nutrition, and increases notably and persistently the temperature of the parts that are so treated. The benefit of such applications is sometimes considerable, even in cases of paralysis from an organic disease, when there is a great coldness of the paralyzed parts.

This would be the place to speak of hydrotherapy, if I had time to treat of all the therapeutical means. I will only say, that an important addition to the proofs of the reflex influence of cold water on blood-vessels has been obtained by Dr. L. Fleury, who, by careful measures, has ascertained, that, after the application of a cold douche on the skin, a congested spleen or a congested liver will sometimes diminish in volume much more than had been stated by other practitioners. Several interesting facts lately observed by a talented young physician, Dr. Béni-Barde, give a confirmation to the view that the therapeutic influence of hydrotherapy is due to a reflex action on the internal organs from the excitation of the skin by cold water.

3. *Actual cautery and other applications of heat.*—

Jobert de Lamballe,¹ Valleix,² and others have exaggerated the advantages of the so-called transcurent cauterization against neuralgia; but there is no doubt, that this means is one of the most valuable in that affection, and is very useful against other neuroses. I may say, that it is not at all necessary to produce a burn that will give a great discharge. If the iron employed has a smooth surface; if, besides, it is applied only at white heat, and passed quickly over the skin with a gentle pressure,—it hardly gives pain. The epidermis and a very thin layer of the skin dry up and fall off within two or three days, leaving a reddish mark, which disappears before very long. This means I have employed with great advantage in a case of angina pectoris, and in many cases of epilepsy and neuralgia, and with some benefit in cases of contracture, of torticollis, of paralysis agitans, &c. The application of heat in many other ways (by Mayor's hammer, for instance) is very useful in a great many cases of nervous affections. In a case of coma with convulsions, due to a complete arrest of the urinary secretion after an attack of renal hæmaturia, in 1851, Dr. Tholozan and myself, after twenty-four hours of unsuccessful treatment, decided to apply heat on the skin of the loins and sides of the abdomen. A large silver spoon was dipped into boiling water, and was applied on eight or ten places. To our surprise and delight, we soon found the respiration improving; and, in less than a quarter of an hour, the convulsions

¹ *Etudes sur le Systeme Nerveux*, Paris, 1838, vol. ii. p. 648.

² *Guide du Médecin Praticien*, 4^{ème} ed., Paris, 1860, vol. i. p. 656.

ceased, and the patient came to his senses, and passed a little water. The return of the urinary secretion had saved him.¹ No doubt the irritation of the skin had acted by a reflex action on the secretory nerves of the kidneys, and produced the secretion of urine.

4. *Alternative applications of cold and heat.*—Led by the well-known powerful influence of alternative immersions of newly born children into cold and warm water to restore respiration, I have often applied, with more or less good effect, cold and hot water to the spine, with a view of producing a contraction of blood-vessels of the spinal cord. Whether these vessels are already somewhat contracted, as is most likely the case in reflex paralysis or reflex anæsthesia, or dilated, as is often the case in hysterical paraplegia, some good may be obtained in these two opposite conditions from the use of cold and hot applications, owing to causes which I will explain in another lecture. I have found alternative applications of ice and hot poultices very useful against neuralgia.² A very able physician of London, Dr. J. S. Ramskill has obtained some benefit from alternative immersions of a paralyzed limb into very cold and hot baths.

¹ A few years afterwards, the patient, who was a physician, succeeded with me, by the same means, in saving the life of a patient who was attacked with cholera, aggravated by uræmic coma and convulsions.

² These alternative applications of ice (for ten minutes) and hot poultices (for an hour), which I long ago recommended as a means of preventing the formation of bedsores and sloughs on the nates and elsewhere in cases of myelitis, spinal meningitis, or fracture or dislocation of the spine, typhus, &c., have now been so often employed successfully by myself and many other medical men, that I think I may safely say that these morbid alterations of nutrition might be always prevented by those simple means. (See the valuable work of Drs. S. W. Mitchell, G. R. Morehouse, and W. W. Keen, on "Gunshot Wounds, and other Injuries of Nerves," Philadelphia, 1864, p. 25.)

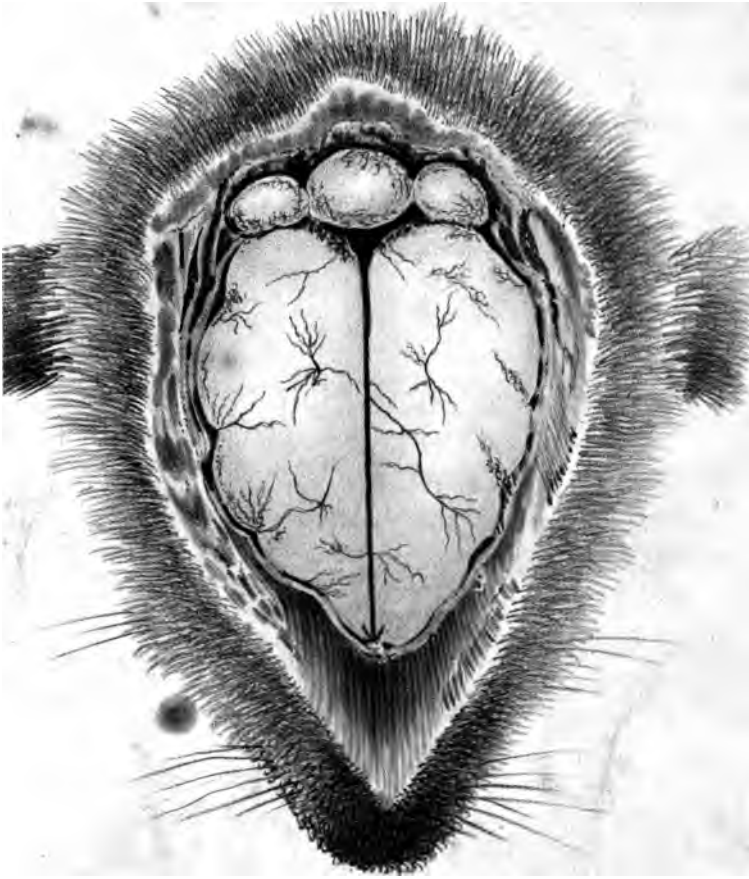
5. *Cauterization of fauces and larynx.* — A man of some talent, who unfortunately allied eccentricity, if not charlatanism, to a genuine love of his profession, Dr. Ducros,¹ used to treat many nervous and other complaints by the application of ammonia to the fauces. More rational researches have shown, that a cauterization of the fauces, and, still better, of the mucous membranes of the larynx or pharynx, is of the utmost value in the treatment of whooping cough, and other spasmodic affections of the larynx or bronchial tubes, of diphtheritic or hysterical paralysis of the larynx and pharynx, and in that form of epilepsy which is due to laryngismus.²

6. *Acupuncture, electro-puncture, and faradisation.* — As there is nothing new to be said about these means, I will only state, that they are among the most powerful against paralysis, and very useful against neuralgia, wasting palsy, contracture, chorea, trembling palsy, and some other neuroses. Acupuncture and electro-puncture are certainly too much neglected in our time.

7. *Other kinds of irritation of sensitive or incident nerves.* — Many applications on the skin have a great power in changing the state of nutrition of the nervous centres or of the peripheric parts attacked with pain, spasm, &c. Of the means of treatment of this kind that have recently been proposed, I will only point out the use of nitrate of silver and of sulphuric acid on the

¹ Comptes rendus de l'Academie des Sciences, vol. xiii. p. 1150, vol. xv. p. 647, and vol. xvi. p. 1208.

² See Dr. Eben Watson's work on the "Topical Medication of the Larynx," London, 1854, pp. 103-164.



D.

Rabbit killed by Prussic
acid and held by its
hind legs.

the arseniate of soda, Dr. Noël Guéneau de Mussy, who has often employed it lately, recommends its being used with subcarbonate of soda; 100 grammes (3½ ounces) of this last remedy, with one gramme (one scruple) of the arseniate, for a bath.

good effects it can give, consists in a pressure on the par vagum and the cervical sympathetic nerve. It has been employed with the idea of diminishing the quantity of blood in the head by pressure on the carotid arteries; and it has proved useful in cases of mania, of headache, of vertigo, and particularly as a means of shortening a fit of epilepsy. Dr. Alexander Fleming¹ has also made a successful use of that means to induce sleep. We owe to Dr. A. C. Pinel, and to that most ingenious and accurate physiologist, Dr. Augustus Waller,² the demonstration, that the principal effect of an attempted pressure on the carotid artery is to irritate and put in play the par vagum, and diminish, consequently, the movements of the heart. My own researches show that the cervical sympathetic nerve also is often excited, as proved chiefly by the dilatation of the pupils. If the pressure is considerable, the effects of a section of the two nerves, but chiefly of the par vagum, are observed.³ I will return to this subject in subsequent lectures; adding only now, that we have, in the compression of the cervical sympathetic, a most valuable means against the form of epilepsy called *petit mal*.

¹ See the "British and Foreign Medico-Chirurgical Review," April, 1855, p. 404, American edition.

² See "Proceedings of the Royal Society," London, 1861, vol. xi. p. 302.

³ In performing this operation, it is important to avoid pressure on the veins of the neck or on the trachea, which parts have most likely been compressed in the cases described in the following extract from a work of Jacobi. There is "a feeling of burning heat, which spreads suddenly over the head and neck down to the chest; or, when the compression was merely upon one side, over the corresponding side of the head and neck, with a feeling of heat within the head in many cases. The face becomes darker, with frequently the production of a vivid color; an extremely painful sensation of compression of the chest; a feeling of tension, weight, and pain in the head; giddiness, staggering, sleepiness; ac-

V. SPECIAL MODES OF TREATMENT IN PERIODICAL NERVOUS AFFECTIONS.

It is not my intention to speak now of the well-known useful influence of sulphate of quinine against perfectly periodical attacks of neuralgia, of epilepsy, &c.: I only wish to speak of a method of perturbation of the nervous system which I have employed with great advantage in some of those cases of local convulsions, of attacks of epilepsy, of hysteria, &c., which either recur nearly at fixed periods, or are preceded by a warning that gives time to make use of the means I will now mention. In a case of spasmodic attacks of muscles of the jaw and face, preceded by a sensation of pricking in the cheek, and occurring several times a day, in a boy seven years old, I found that violent exercise on a swing always prevented the fit, when the patient had time to run to, and make use of, the swing before the muscular contraction had begun. By that means, which never failed, the boy was many hundred times saved from attacks, during more than two years that his nervous affection lasted. The cure occurred on the coming-out of a molar tooth, which, however, had not given the least pain. The cure has persisted, and the boy has become a full-grown man without any nervous disturbance analogous to that of his childhood. The beneficial influ-

tual, sudden sleep, with stertorous breathing; in many, incipient syncope, with uncertainty in the use of the lower extremities, stumbling; and, in some cases, they suddenly fall down with entire insensibility, but speedily recover." (Jacobi, "On the Nature and Treatment of Insanity," quoted in "British and Foreign Medical Review," 1846, vol. xxii. p. 14.)

ence of this or of almost similar modes of therapeutic perturbation of the nervous system I have observed since in a number of cases of hysteria and epilepsy.

A great many other means of changing the state of the nervous system have been employed with some benefit by other physicians, or by myself. Among these means, I will merely mention here the following: A ligature round one or several limbs (even when there is no evident aura), tied strongly and suddenly; a pretty sharp pinching of the skin; a rather large dose of an emetic, taken with a great quantity of water; a cold shower-bath on the back; the application of an interrupted and powerful electro-magnetic current; a dose of twelve, fifteen, or eighteen grains of sulphate of quinine, about an hour before the expected attack; an enema of a drastic medicine; the inhalation of chloroform, &c. I will give more details on these important perturbing means in some of the subsequent lectures.

VI. SPECIAL USE OF ANÆSTHETICS.

I have already said, that chloroform, taken by inhalation, may be useful, as a means of preventing an expected attack of hysteria, of epilepsy, &c. I will now point out the importance of inhalations of chloroform in three particular kinds of cases.

1. When the comatose state due to uræmia, or following a violent attack of epilepsy, is frequently interrupted by tonic or clonic spasms of the respiratory muscles, increasing the profoundness and duration of

the coma, I have employed inhalations of chloroform without any appearance of greater harm than is usual in surgical cases, and with the beneficial result of shortening the duration of the stupor by preventing the spasmodic contractions or diminishing their violence. This mode of treatment is known to be particularly useful in almost analogous circumstances; *i.e.*, in cases of puerperal convulsions. In many cases of epilepsy, in which a large number of attacks usually occurred in a day or a few days (such a series of seizures being followed by complete freedom from fits for three, four, or six weeks), and in which also a comatose state usually appeared soon after a few attacks had taken place, I have found the benefit due to chloroform to be very great; the fits being much lessened in frequency and violence, the comatose state rendered shorter and less profound, and the period of great mental aberration after the cessation of the coma considerably diminished.

2. In the maniacal or delirious state due to hysteria, epilepsy, or uræmia, and also in cases of aggravated chorea preventing sleep, chloroform is of immense service, particularly if morphia, or some other somniferous remedy, is given to the patient, either by the hypodermic method or by injection into the rectum, as soon as chloroform has produced sleep. Dr. Briquet states, that, nine times out of ten, he has stopped attacks of hysteria by inhalations of chloroform.¹ I have not been quite so successful as Dr. Briquet in cases of hysterical convul-

¹ See "Traité Clinique et Thérapeutique de l'Hystérie," Paris, 1859, p. 700.

sions; but I have ascertained that attacks of delirium and mania due to hysteria (and also to epilepsy) are almost always quickly brought to an end by chloroform.

3. In the case of a gentleman who had pretty regular weekly attacks of epilepsy, I once employed chloroform by inhalation, almost without interruption for two or three days successively, with the object of preventing the expected fit or fits. It was of the greatest importance in that case to prevent a fit, as the patient in a preceding attack had fractured and dislocated one of his arms. The inhalations of chloroform saved him from the expected attack, and the callus had time to be formed before he had another fit. This patient was seen with me by a very able physiologist and medical practitioner, Mr. Robert Dunn, of London.¹

¹ The details of this case have been published by Mr. Dunn in "The British Medical Journal," London, 1862, p. 140. The case is a remarkable one in more than one point of view. It shows the singular co-existence of dislocation of the shoulder-joint with a fracture of the neck of the humerus, both accidents resulting probably from a muscular contraction.

LECTURE IV.

GENERAL VIEWS ON THE MODES OF ACTION AND ADMINISTRATION, THE ANTAGONISM, ETC., OF REMEDIES USED AGAINST FUNCTIONAL NERVOUS AFFECTIONS.

Difficulties in finding out the ultimate mode of action of remedies. — Therapeutic analogies and differences of remedies. — Subcutaneous injections in cases of neuralgia and other neuroses. — Influence of chloroform in increasing the rapidity of cutaneous absorption. — Usefulness of several neglected methods of administration of remedies. — Advantages of alkaloids over extracts and other compounds. — Antagonism between belladonna, stramonium, hyoscyamus, quinine, on the one hand, and opium on the other. — Necessity of large doses of remedies against neuroses. — Usefulness of association of certain remedies. — Rules of administration of the bromides of potassium and of ammonium in epilepsy. — Mutual influence of certain narcotics upon each other.

GENTLEMEN, — So great have been the recent advances of our knowledge as regards the different points which are to be spoken of in this lecture, that a volume of considerable extent and importance might be written about them. I intend, however, to confine myself here to a short account of the principal and most useful facts relating to this branch of therapeutics. I will treat successively of the mode of action of remedies, and their analogies and differences, their administration, selection, antagonism, doses, and association.

I. MODE OF ACTION OF REMEDIES.

I have already mentioned the peculiar influence of remedies acting by an irritation of the skin. I will now briefly speak of their mode of action after they have

entered the blood, and been carried to the principal parts of the system, leaving details for other lectures.

If we had only to learn what are the effects caused by remedies on the brain, on the spinal cord, on the heart, &c., we might think that the extent of our actual knowledge of the mode of action of remedies is truly considerable; but if we are not contented with this partial knowledge, and wish to understand by what mechanism or what peculiar direct or indirect influence these effects are obtained, we find that very little is known yet on these most important points. This is much to be lamented, as therapeutics will only cease to be empirical when this last kind of knowledge shall be fully acquired.

We, however, have now good reasons to hope, that the time is not far distant when the ultimate mode of action of the most powerful remedies will be pretty well known. We shall then be enabled to employ them in those cases which can really be benefited by them, instead of ordering them blindly, as we now so often have to do, producing sometimes much more harm than good.

Notwithstanding the great difficulties attending researches on the mode of action of remedies, I have, I repeat, a great hope that much will soon be done with regard to that important subject. This hope is grounded: first, on the results already obtained by several experimenters on the mode of action of strychnine, of woorara, of veratrine, and a few other poisons and remedies; secondly, on the fact that the difficulties to be surmounted are becoming more and more known, and that means of

overcoming them have lately been found by physiologists and by physicians.

Among the difficulties, there are some depending on the number and variety of parts on which the remedies may act to produce their effects, and others due to the fact, that physiologists and toxicologists, in making researches on remedies, have almost always employed toxic doses. This last cause of error is especially unfortunate, as a number of remedies may have quite opposite actions in remedial and in toxic doses.

As regards the number of parts on which remedies may act to produce their effects, I will show by a few examples what the difficulties are. Let us, for instance, try to find out on what part a remedy acts to produce the constriction of the pupil. It may do so either by paralyzing or by exciting certain parts of the nervous system or of the iris. If it paralyzes, it may be either a part of the spinal cord or medulla oblongata, from which originate the cervical sympathetic nerve, or that nerve itself in some part of its length from the eye to the spinal cord, or also the radiated or dilator muscular fibres of the iris. If its action takes place through an excitation, the part acted on may be the base of the brain near the origin of the third pair of nerves, or that of the fifth pair of nerves; or it may be the iridian fibres of the third pair, or some fibres of the ophthalmic branch of the fifth pair of nerves; and it may be also the annular muscular fibres or sphincter of the iris.¹

¹ See the valuable researches of Professor Donders and Dr. De Ruiter, on this subject, in Donders's work, "On the Accommodation and Refraction of the Eye," London, 1864, p. 588.

The other kind of difficulty I have mentioned arises from the fact, that a remedy, in different doses, can produce two opposite effects. Belladonna, for instance, by its influence on the blood-vessels of the spinal cord, will diminish sensibility, the reflex faculty, the tendency to convulsions, &c. ; but, when its dose is toxic, sensibility and the reflex faculty become morbidly increased, and convulsions occur. In both cases, probably, there is, at first, the same effect, — *i.e.*, a contraction of the blood-vessels of the spinal cord ; but, in the second case, the contraction is so great, that the muscular fibres of the blood-vessels are soon exhausted, and become paralyzed, allowing a considerable congestion to take place in the spinal cord.¹

In other lectures I will return to the subject of the action of remedies ; and I will now only refer those persons who desire to enter into original researches in this vast and fertile field of inquiry to an admirable paper that may serve as a model for such researches : I mean the paper published by MM. Martin-Magron and Buisson, on the “ Action of Strychnine compared to that of Woorara.”²

¹ When blood-vessels in the ear and face of a dog are made to contract considerably by a very powerful galvanic excitation of the cervical sympathetic nerve, we find, that, after a short time, they are exhausted and paralyzed, which is evidenced by their becoming as much, if not more, dilated, as when their motor nerve is divided and paralyzed.

² See “ Journal de la Physiologie de l’Homme,” &c., 1859, vol. ii. pp. 473, 584 ; and 1860, vol. iii. pp. 117, 323, and 522.

II. ANALOGIES AND DIFFERENCES OF REMEDIES.

The more we progress in our knowledge of the mode of action of remedies, the more we find that *a priori* notions, grounded on the chemical properties of the substances which we try as remedies, are very rarely verified. On the one hand, if we study the effects of salts of the same base or those of the same acid, we find that they vary extremely, even when the salts we compare are isomorphous, and possess almost identical chemical properties. On the other hand, there are sets of remedies which have no chemical resemblance whatever, and which will, however, produce a great many similar effects. The recent advances of our knowledge as regards the action of belladonna, the ergot of rye, and the bromide of potassium, afford an interesting illustration of this statement. These remedies are useful against incontinence of urine, seminal losses, satyriasis, hyperæsthesia (general or localized in the larynx or pharynx, the neck of the uterus, the sphincters of the bladder and the anus, the urethra, &c.), epilepsy, whooping-cough, photophobia, constriction of the pupil, congestion of the spinal cord or its meninges, albuminuria, &c. There are, however, marked differences in the degree of remedial power of these three substances against those morbid states. For instance, the ergot of rye is more powerful than the others against albuminuria and congestion of the spinal cord and its membranes; the bromide of potassium is more

powerful than the others against epilepsy, satyriasis, &c.; and belladonna against whooping-cough, hyperæsthesia, incontinence of urine, constriction of the pupil, photophobia, &c. Most of these remedial effects are evidently due to a contraction of blood-vessels, as are also other therapeutic effects, — such as the stoppage of hæmorrhages and of the mammary and salivary secretions produced by belladonna and the ergot of rye.¹

I will not say much as regards the differences of action of remedies which chemistry might lead us to suppose more or less similar, one to the other, in their remedial influence. The proofs of the dissimilarity of action of these substances are very abundant. I will only mention a few at random. If we compare the effects produced by the chloride of a base with those of an iodide or a bromide of the same base, we find that they differ widely. If, on the other hand, we compare the chloride of barium with another chloride, we find that there is also between them a very great difference

¹ I cannot say if the bromide of potassium would also be useful against a hæmorrhage; but this is exceedingly probable. For the sake of brevity, I have not given the names of the observers who have ascertained the usefulness of the three above-named remedies in so many nervous and other morbid states or affections. I think, however, I should say, — 1st, That the influence of the bromide of potassium against photophobia has been particularly demonstrated by Messrs. Cambron and Rossignol, who use it as a collyrium (two parts for thirty of water); 2d, That Professor Von Willebrand has shown that the ergot of rye is, like belladonna, an excitant of the unstriped muscular fibres of the blood-vessels of the eye, and able, consequently, to diminish vascular congestion in that organ as in the spinal cord; 3d, That Dr. Poyet and Dr. Commarmond have found, that rye-bread containing the ergot, like belladonna, stops the mammary secretion; 4th, That the researches of Dr. Addinell Hewson, made on seventy-eight boys attacked with nocturnal involuntary emissions of urine, have given a decisive confirmation of the already known therapeutic value of both the bromide of potassium and belladonna in that affection.

of action on the animal or on the human economy. So it is, although to a less degree, with the bromide of potassium, compared with the bromide of iron,¹ or even with the bromides of ammonium and sodium.

I have mentioned these facts to show, that we are to look to experiments on animals, and to careful trials on man, to learn the physiological and therapeutical effects of remedies, and that chemical analogies cannot lead to any conclusion as regards the action of remedial substances.

III. MODES OF ADMINISTRATION OF REMEDIES.

One of the most important advances in therapeutics in our days consists in the method of subcutaneous injections of remedies. Led by the idea of applying narcotics directly on nerves attacked with neuralgia, Dr. Alexander Wood, of Edinburgh, opened this new field in therapeutics in 1855.² Since that time, many practitioners have found that hypodermic injections are often the best mode of administration of remedies, not only against local affections, but also against every form of functional nervous complaints, and also against gout, rheumatism, fever and ague, &c. Much credit is due

¹ Dr. Charles Bland Radcliffe has ascertained that the bromide of iron has no efficacy against epilepsy. My own trials lead to the same conclusion.

² The first paper of Dr. Wood was published in April, 1855, in "The Edinburgh Medical and Surgical Quarterly Journal," p. 265; but his discovery had been made in 1843, *i.e.*, long before this publication, and the method soon became generally known in Edinburgh. His second paper appeared in "The British Medical Journal" for August, 1858, p. 721.

to Mr. Charles Hunter, of London,¹ for his researches on this new therapeutical method. To him, more than to any other investigator, we owe the solid grounding, if not the complete demonstration, of the three following propositions: 1. That equal effects follow distant and local injections in neuralgic cases. 2. That by distant injections (in various places) the ill-effects of repeated local injections are avoided. 3. That various affections, which are neither local nor neuralgic, can be treated with benefit by this plan.

This method of administering remedies, which is now very extensively used, has very great advantages over most of the other methods. I will only point out a few of these advantages: 1. Rapidity of effect. 2. Certainty that the remedy will not run the risk of being decomposed by food, secretions, or fæces, as may be the case in the digestive tube. 3. Possibility of introducing safely into the circulatory system a much larger dose than by other methods. This last advantage is the principal one in the use of the hypodermic method against neuralgia. This explains how neuralgic patients who had taken apparently large doses of narcotics by the mouth, with no permanent and even no temporary marked benefit, are sometimes completely cured by one or by a few hypodermic injections of narcotics, — a fact which has been observed by Dr. Alexander Wood, Dr. Rупpaner, Dr. Béhier, Mr. Charles Hunter, myself, and many others.

¹ See "The Medical Times and Gazette" for 1858 and 1859, and his pamphlet, "On the Speedy Relief of Pain and other Nervous Affections, by Hypodermic Injections," London, 1865.

I have ascertained that a subcutaneous injection of purely narcotic substances is generally as useful when made at a great distance from the seat of pain (whether neuralgic or inflammatory) as when made on that very seat. Even in cases of traumatic neuralgia, I have seen, as Dr. Mason Warren¹ had before me, that distant injections can be as good as local injections. I must say, however, that I have seen sometimes, in common cases of neuralgia, and especially when I made somewhat irritating injections, that a better effect was obtained when the injection was made near the seat of pain than at a great distance from it. The difference is probably due to the favorable influence of a counter-irritation acting, like a blister, a burn, &c., on some ramifications of the affected nerve, when the injection was made in the locality of the pain or in its neighborhood. A new method of counter-irritation, which promises to be of great efficacy and which consists in sub-cutaneous injections of irritating substances, has lately been recommended by Dr. Luton.² The mere mechanical irritation by the pressure of a fluid may also have some beneficial effect. Indeed, I am told by a very intelligent and learned young physician, Dr. E. C. Seguin, of New York, that he has seen an evident good effect from an injection of pure water in some cases of neuralgia.

Injections ought to be made in the cellular tissue surrounding the affected nerves, in cases of tetanus, hydro-

¹ American Journal of the Medical Sciences, for April, 1864, p. 323.

² Archives Générales de Médecine, Oct. et Déc., 1863, pp. 385 et 687.

phobia, epilepsy, or any other neurose due to a wound, as, in such cases, it is most important to obtain the benefit of the local action of the remedy on the wounded or irritated nerve-fibres (however little that may be), in addition to the effect of the remedy after its passage into the blood.

More than seven years ago, I was led, by the knowledge of the antagonistic effects of morphia and atropine on the brain, to inject these two agents together, so as to reap the benefit of the therapeutic effects of the one added to those of the other against pain. The doses I at first employed were half a grain of the sulphate of morphia to one-sixtieth of a grain of the sulphate of atropine. For reasons to be mentioned hereafter, I now employ from one-half to two-thirds of a grain of the sulphate of morphia with one twenty-fifth of a grain of the sulphate of atropine. Great advantages are obtained by this combination: 1. An addition of the good effects against pain of the two remedies; 2. The possibility of employing safely, or at least without great or lasting cerebral or cardiac disturbances, large doses of these narcotics.

The hypodermic method of administration of remedies has already proved useful in cases of headache, vertigo, delirium, mania, hysteria, epilepsy, eclampsia, chorea, tetanus, neuralgia, and all kinds of pain, &c. As regards the substances employed heretofore in injections, besides the two principal, morphine and atropine, I will only name strychnine, veratrine, narceine, quinine, and cyanhydric acid. This last remedy has especially been

used, and with great benefit, by Dr. D. Macleod, in cases of acute and chronic mania, puerperal or menstrual mania, melancholia, and epilepsy. He employed from two to six drops of Scheele's diluted acid with thirty drops of water.

The first interesting experiments of Dr. B. W. Richardson,¹ by which he thought he had found a valuable mode of producing local anæsthesia, have led Dr. Aug. Waller² to a very important discovery. He found, that certain substances, such as atropine, strychnine, morphine, and the tincture of aconite, when mixed with chloroform and applied on the skin, are absorbed very rapidly; while if alcohol, instead of chloroform, is mixed with the above substances, absorption is much delayed, or even altogether prevented. The possibility of introducing rapidly into the blood the most active narcotics and other remedies, without having to perform the operation of hypodermic injection, will prove of great value in those cases in which an operation, however slight, is much dreaded, and in cases in which it may be found necessary to keep the patient for a long time under the influence of the treatment (for instance, in tetanus, in hydrophobia, in persistent neuralgic pains, &c.)

Within the last ten or fifteen years, several facts of importance as regards the selection of the proper surface of absorption of certain remedies have been clearly made out. I will only mention the following:—

¹ See "Medical Times and Gazette," for Feb. and June, 1859, pp. 156, 647.

² See "Journal de la Physiologie de l'Homme," &c., 1860, vol. iii. p. 443.

1. Professor Bernard¹ and other observers have ascertained that woorara is hardly absorbed by the mucous membranes of the mouth and stomach, while it is very quickly absorbed when put in contact with some other membranes, or with the subcutaneous cellular tissue.

2. Mr. W. S. Savory² has ascertained that strychnine is absorbed so much quicker by the mucous membrane of the rectum than by the stomach, that a dose only one-fourth of another will act with greater energy in the rectum than the much larger dose in the stomach.

3. I have found that ointments of belladonna and opium employed against neuralgic and other uterine pains act with greater rapidity, and much more benefit, when pushed up on a small lint ball in the rectum than in the vagina; showing that absorption is more rapid by the mucous membrane of the rectum than by that of the vagina.³

Not long ago, the method consisting in applications of narcotics on the skin, deprived of its epidermis by a blister, was rather thrown into the shade, owing to the superiority of the hypodermic method. I protest, however, against the abandonment of a method which has the double advantage of counter-irritation and rapid

¹ *Leçons sur les Effets des Substances Toxiques et Médicamenteuses*, Paris, 1857, p. 283.

² See "The Lancet" for 1863, vol. i. pp. 515, 548.

³ According to Charpentier, jun., hyoscyamine, daturine, and atropine produce their effects quicker after having been injected in the rectum than by the hypodermic method. I have made comparative experiments, which do not confirm this statement. It seems true, however, that, in certain persons, absorption of atropine is almost as rapid by the mucous membrane of the rectum as by the cellular tissue, under the skin. (See the researches of Charpentier in "Annuaire de Thérapeutique de Bouchardat pour 1864," p. 21, *et seq.*)

absorption of a narcotic, and which may sometimes prove more useful than subcutaneous injections. In a case of crural neuralgia which had not been markedly benefited by hypodermic injections of morphia and atropine, I have obtained a quick amelioration, and ultimately a cure, from a series of blisters (by the hartshorn ointment) and applications of sulphate of morphia on the denuded dermis.¹

There are two other methods of administration of remedies which have lately been much employed, especially, however, against affections quite different from neuroses. One of them, consisting in inhalation of pulverized fluids, may be very useful against asthma, spasm of the glottis, whooping-cough, paralysis of the pharynx or larynx, &c. The other method, which consists in smoking medicated cigars and cigarettes, may be employed with advantage, not only against the laryngeal and other neuroses just named, but also against epileptic laryngismus, hysteria, and even tetanus. Hyosciamus, stramonium, belladonna, and many other remedies, can be used by one or the other of these two methods of administration.

IV. SELECTION OF REMEDIES.

The time is fast coming when many complex remedies will be but seldom employed, and their active

¹ I do not speak of a mode of administration of narcotics proposed by M. Lafargue ("Bulletin de Thérapeutique," Jan. 15, 1861, p. 22), as I do not see any advantage in it over the hypodermic method. It consists in the introduction, under the skin, of small, hard cylinders composed of mucilage, with a little powdered sugar and the usual dose of atropine, morphine, strychnine, veratrine, &c.

principles almost exclusively used. Belladonna, the preparations of which are so extremely variable in strength, and on which, therefore, we can place but little reliance, will be one of the first of the complex remedies almost altogether abandoned, to be replaced by its active principle which possesses its essential physiological and therapeutic properties.

But some complex remedies, such as opium, and particularly its tincture, will escape the fate of belladonna and other substances, owing to the fact that its effects cannot be fully obtained by the use of any of the large number of very different active principles it contains. Besides, in some remedies which seem to contain but one active remedial principle, there are physiological and therapeutical properties which appear not to exist in the only yet known active principles extracted from them. This is said to be the case with cantharidine, which does not seem to have the power of the tincture of cantharides on the genital organs.

Amongst the active principles which have recently been used instead of the complex substances from which they are extracted, the principal are atropine, veratrine, the valerianic acid, digitaline, and even aconitine, notwithstanding the real worth of Fleming's tincture of aconite, and notwithstanding also the assertion (which my experience contradicts) of Schroff, that aconitine acts differently from aconite.

V. ANTAGONISM BETWEEN SEVERAL IMPORTANT REMEDIES.

It would be out of place, in such a course of lectures as this, to enter into full details on this important subject. I cannot, however, avoid saying a few words, at least, on the antagonistic effects of remedies which are very frequently employed together in cases of functional nervous affections. I will first speak of the antagonism between the properties of opium and those of belladonna, stramonium, alcohol, and quinine. The antagonism of belladonna and opium has been known for centuries. Recently, however, more accurate notions have been obtained on this subject, owing particularly to the researches of Professor Béhier,¹ Dr. C. C. Lee,² Dr. W. F. Norris,³ and Drs. S. W. Mitchell, Morehouse, and Keen.⁴ From the researches of these practitioners and experimenters, as well as from my own, it results, that, besides the well-known antagonistic effects of these two remedies on the eye, there is a decided antagonism between them as regards their effects on the heart, on the brain, and on the spinal cord. In consequence of this antagonism, the dose of opium to produce sleep ought to be greater than usual, if belladonna is employed with it; and also the dose of belladonna against reflex paraplegia ought to be greater than usual, if the patient

¹ See "Bulletin de Thérapeutique pour 1859," vol. lvii. p. 41.

² See "The American Journal of the Medical Sciences" for January, 1862, p. 54.

³ See the above-quoted Journal for October, 1862, p. 395.

⁴ See "The American Journal of the Medical Sciences," for July, 1865, p. 67.

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is also taking opium. I might say the same thing as regards the antagonism between opium and stramonium or hyoscyamus.¹ We owe to Dr. Gubler² the discovery, that in many respects, and particularly as regards its action on the brain, quinine is antagonistic to opium; and that, consequently, it may be wrong or right, according to circumstances, to employ these two remedies together. Many facts tend to show also, that alcohol is able to neutralize some of the properties of opium, and particularly its influence on the heart and the skin. Of other remedies often employed in neuroses, one of the most important—strychnine—is somewhat neutralized in its effects by aconite, camphor, woorara, and the calabar bean. There is also an evident antagonism between strychnine and belladonna and the ergot of rye, as I have shown elsewhere.³

The kind of antagonism I have spoken of cannot be considered as due to a chemical neutralization. As regards this last kind of antagonism, it is important to know, that the most powerful remedies we can employ against neuroses may be rendered inert by the chemical

¹ Notwithstanding the number of cases of apparent cures of poisoning by opium, under treatment by belladonna, I persist, as does also Bouchardat ("Ann. de Thérap. pour 1860," p. 24) in recommending, that poisoning by opium be fought against by coffee, by keeping the patient awake by active and passive movements, and by making him walk, if this is possible. The experiments of Onsum ("Schmidt's Jahrbücher der Gesammten Medecin," 1865, vol. 128, p. 288), of Camus ("Gaz. Hebd. de Méd.," 1865, p. 498), and my own, show, that death by opium takes place from the same dose, whether we employ belladonna or not. These experiments clearly establish, that the toxic effects of these poisons, in certain animals at least, do not neutralize each other.

² Gazette des Hôpitaux, 1858, p. 62.

³ See "Lectures on the Various Forms of Paralysis of the Lower Limbs," Philadelphia, 1861.

influence of certain substances which might be employed with these remedies. We are indebted to Dr. A. Garrod for the demonstration, that alkalies, and particularly the liquor potassæ, destroy the active principles of belladonna, stramonium, and henbane.¹ Bouchardat has shown, that almost all, and perhaps all, the known alkaloids, are precipitated by the iodide of potassium combined with iodine.

VI. ON DOSES OF REMEDIES.

A few remarks deserve to be made under this head. The first one is, that small doses of most remedies are useless, and therefore allow nervous affections to take deeper root in the system; so that we ought (particularly in epilepsy, in tetanus, in neuralgia, in reflex paralysis, in angina pectoris, in whooping cough, &c.) to give as large doses as can safely be borne. The second remark is, that before employing large doses, especially of opium, we must carefully ascertain, that the principal glands, and particularly the kidneys, are all right; as, if not so, a large but ordinarily safe dose might be found toxic. And another remark is, that in affections like tetanus, in which there is an antagonism between the complaint and the remedy, at the same time that we must be giving every hour, or every half-hour, a fresh dose of the remedy, we must be carefully watching for the disappearance of the symptoms of the nervous affec-

¹ See "The Lancet," London, 1857, vol. ii. p. 577.

tion, and their replacement by the symptoms of poisoning by the remedy. In an unpublished case, of which I happen to know the details, an able physician, Dr. P. G—— succeeded in obtaining the cessation of tetanic symptoms; but, unfortunately, new doses of opium were given after that cessation, and the patient died of poisoning by opium.

VII. ASSOCIATION OF REMEDIES.

In the treatment of functional nervous affections, most physicians often give simultaneously to the same patient two or more powerful remedies. This plan, which I almost always follow in treating certain neuroses, has very great advantages; but it is not free from the danger of doing harm to the patient or, at least, of preventing the good effect of one remedy by some influence of another. Clinical observation proves the danger and the advantages of that plan, in demonstrating that the three following changes may take place when two powerful remedial agents are employed together: first, the curative properties of one or both of these substances may be diminished or destroyed by the influence of one upon the other; secondly, the properties may be increased; thirdly, new properties (useful or injurious) may result from the influence of one remedy upon another. Our ignorance as regards the action of remedial substances, one upon the other, in presence of the tissues and fluids of the human organism, is too great for our trying blindly to employ large doses of powerful remedies

simply on the ground of our knowledge of the action of these remedies when given alone, and still less on the ground of our knowledge of their chemical influences, one upon the other, before they enter the human organism. Experiments, therefore, on the therapeutic effects of two, or more, powerful remedies employed together, should be made first with small doses, to be gradually increased if the effects show that this can be safely done.

The importance of the association of certain remedies against neuroses has attracted my attention for a great many years, but especially since March, 1860, after my appointment to the post of physician to the National Hospital for the Paralyzed and Epileptics, in London. By the end of that year, my colleague, Dr. Ramskill, and myself began treating epilepsy with large doses of the bromide of potassium. I was soon led to associate the iodide of potassium with the bromide; and it became almost at once evident, that, in most cases of epilepsy (whether idiopathic, symptomatic, or sympathetic, but especially in that form, which is much more common than it is admitted to be, in which that convulsive affection is allied with, or due to, a congestion of the base of the brain or its meninges), these two remedies did more good than either of them alone. By the end of 1861, after I had ascertained that the bromide of ammonium has a special therapeutic influence in cases of congestion of the medulla oblongata and of the upper parts of the spinal cord, I began to associate that salt with the bromide and the iodide of potassium in the treatment of epilepsy.

In 1862 and 1863, some of my American patients having been either considerably relieved or apparently cured by the combined use of these salts, my prescriptions were spread broadcast over the United States, by the patients themselves, by their friends, and by greedy or quackish chemists. That mode of treatment of epilepsy has, in this way, been submitted to an extensive trial, which leaves no doubt as regards its superiority. Although it certainly does not often cure permanently, it usually diminishes considerably the violence and the frequency of attacks, and is much more successful than the various modes of treatment by the best remedies against epilepsy, such as atropine or belladonna, the sulphate of copper, the nitrate of silver, strychnine, valerian, zinc, digitalis, or the means of counter-irritation by applications of ice, moxas, croton oil, &c., on the spine or the head.

In cases in which patients had derived no benefit, or had ceased to have any, from the use of one of the above remedies, or of the bromide or iodide of potassium, alone or combined, or of the bromide of ammonium alone, I have very often ascertained the superiority of curative influence of the association of the bromide of ammonium with the iodide and bromide of potassium. A decided and lasting amelioration was obtained in most of those cases from the use of the three salts together.

My usual prescription for an adult, in cases of idiopathic epilepsy, and also in cases of that convulsive affection apparently caused by a congestion of the base of the brain or of its meninges, is the following: —

℞. Potassii Iodidi, ℥ j.
 Potassii Bromidi, ℥ j.
 Ammonii Bromidi, ℥ ij. ss.
 Potassæ Bicarbonatis, ℥ ij.¹
 Infus. Calumbæ, fl., ℥ vj.
 M.

A teaspoonful before each of the three meals, and three teaspoonfuls at bedtime, with a little water.

In cases of syphilitic epilepsy, I hardly need to say that the prescription must be modified so as to contain a good deal more of the iodide of potassium (five or six drachms instead of one). In cases of epilepsy in which the attacks are ushered in by a violent laryngismus or trachelismus, I change the relative quantity of the two bromides, diminishing by two drachms the bromide of potassium, and increasing by one drachm, or one and a half, the bromide of ammonium.

There are rules relative to the treatment of epilepsy by the bromides of potassium and ammonium, employed together or separately, which are of so great importance, that I will take this opportunity to mention them briefly, postponing the details till I treat especially of epilepsy. These rules are, —

1. That the occurrence during the day of the sleepiness caused by these remedies can be avoided by giving relatively small doses in the daytime, and a much larger dose late in the evening.

2. That the quantity of these medicines to be taken

¹ When the patient's pulse is weak, I substitute for the bicarbonate of potash the sesquicarbonate of ammonia, and for the six ounces of infusion of colombo, an ounce and a half of the tincture of that medicine with four ounces and a half of distilled water.

each day must be large enough to produce an evident though not complete anæsthesia of the fauces and upper parts of the pharynx and larynx; that daily quantity being (according to the idiosyncrasy of the patient) from forty-five to eighty grains of the bromide of potassium, and from twenty-eight to forty-five grains of the bromide of ammonium, when only one of these salts is employed, and a smaller quantity of each, but especially of the second, when they are given together.

3. That, considering that the bromide of potassium (and, in a small degree, also the bromide of ammonium) very rarely produces any good effect against epilepsy, without producing also an acne-like eruption on the face, neck, shoulders, &c., and that there seems even to be a positive relation between the intensity of the eruption and the efficacy of the remedy against epilepsy, — it is most important to increase the dose when there is no eruption, and also when the eruption is disappearing, unless the dose given in the twenty-four hours is already so large, that any increase of it produces great sleepiness in the daytime, a decided lack of will and of mental activity, dulness of the senses, drooping of the head, considerable weakness of body, and a somewhat tottering gait.

4. That it is never safe for a patient taking either of the bromides or both, and receiving benefit therefrom, to be even only one day without his medicine, so long as he has not been at least fifteen or sixteen months quite free from attacks. Indeed, it is very frequent that patients neglecting this rule are seized again with fits after

an immunity of several or of many months, one, two, or only a few more days after the interruption of the treatment. In several cases, even after an apparent cure of ten, eleven, or twelve months, and, in one instance, of thirteen months and a few days, there has been a re-appearance of the disease after the treatment had been abandoned for only a few days, or a week. One of the ablest physicians of the United States, my friend Dr. Edward H. Clarke, has made a similar observation in one case after an interruption of the fits for a whole year.¹

5. That the debilitating effect of the bromides in patients already weak, as are most epileptics, ought to be prevented or lessened by the use of strychnine, arsenic, the oxide of silver, ammonia, or cod-liver, cold douches or shower-baths, and, of course, wine and a most nourishing diet.²

6. That iron and quinine — which are generally injurious to epileptics, except in cases in which their ner-

¹ It has recently been stated by Dr. Namias, of Venice, and by Dr. Rabuteau ("Gazette Hedomadaire de Médecine, etc., 24 Avril, 1868," p. 263), that the bromide of potassium is still found in the urine a very long time after it has been taken. Namias says he found it after fourteen days, and Rabuteau after a month; but they do not say how much they found, and their experiments were made on small animals. My friend, Dr. Hameau, grounding his opinion on the researches of Namias, thought that the bromide of potassium accumulates in the system, and explained in that way the death of a patient poisoned by that salt ("Journal de Médecine de Bordeaux, Mars, 1868"). I will only remark here that the patient took at times sixteen *grammes* (more than half an ounce) a day of that powerful remedy.

² In making use of strychnine or arsenic, it must be kept in mind that not only the bad influence of the bromides, but also their favorable influence against epilepsy can be diminished by these powerful agents (especially strychnine), and that it is, therefore, necessary when these agents are used to increase the dose of the bromides. The antagonism between strychnine, which acts in increasing the reflex faculty of the nervous centres, and the bromides, which diminish that faculty, may be so great as to produce almost a complete annihilation of the influ-

vous affection is caused, or at least aggravated, by chlorosis, anæmia or malarial cachexia — are more particularly injurious in cases in which the bromides are taken.¹

7. That a gentle purge every five or six weeks usually gives a new impulse to the usefulness of the bromides against epilepsy.

The association of the bromides of potassium and of ammonium with the iodide of potassium has also given me better results than the use of one only or two of these remedies in the treatment of chorea, of hysteria,² of reflected and other kinds of spasms or contracture, of reflected neuralgia, of several forms of mental disorder due to a peripheric irritation or to an intra-cranial congestion, &c.

I have observed a very curious fact in employing together the bromide of potassium and the bromide of ammonium. I have ascertained, that, without producing the phenomena which constitute what has been called *bromism* (anæsthesia of the throat, nostrils, &c., weakness especially of the neck and spine, lack of will, sleepiness, stupidity, &c.), I could give in a day sixty

ence of the bromides, and partly that of strychnine. In one case, 132 grains a day of the bromides were taken without the least appearance of bromism and without any controlling effect over epilepsy, when the patient was taking about one-third of a grain of strychnine a day; while he was strongly *bromidized* under the influence of 80 grains a day of the bromides, when he was not taking strychnine.

¹ There is, however, a salt of iron, which, when given in moderate doses, seems frequently to act favorably, and without any hindrance, in epileptics: it is a double salt, the citrate of iron and strychnine.

² The above compound remedy, however useful, is not one of the best means of treatment against hysteria. Opium and sulphuric ether (internally), in large doses, are certainly much superior to that compound against the various forms of hysteria. So also that compound has not as much power as arsenic or strychnine against chorea.

grains of the bromide of potassium and thirty grains of the bromide of ammonium, while, if I replaced the thirty grains of this last salt by only twenty grains of the other salt so as to give eighty of the bromide of potassium alone, *bromism* was usually produced. And also, if, in place of the sixty grains of bromide of potassium, I added to the thirty grains of bromide of ammonium from twenty to twenty-five grains of this same last salt, *bromism* was again produced. So that ninety grains, *i.e.* a larger dose, of the two remedies taken together did not produce *bromism*, while a *smaller dose* of either employed alone did produce it. If we call *bromism* a bad effect, and if we call a good effect the favorable-influence of these remedies in epilepsy and other neuroses, it can be said that their association in certain doses diminishes their bad effect, while it increases their good effect.

The association of several other remedies leads to nearly similar conclusions as regards their action. For instance, I have found that the association of belladonna to stramonium, to hyoscyamus, to conium, or to aconite (substances which seem, when taken alone, to produce many similar phenomena), increases their good effect, and certainly does not increase, and even seems to diminish, some of their bad effects.

I have obtained much greater benefit against neuralgia or other pains from a combination of the following extracts, than from either of them alone, or from the association of only two or three :—

℞. Extracti Belladonnæ, gr. ʒ.
 „ Stramonii, gr. ʒ.
 „ Cannab. Indicæ, gr. ʒ.
 „ Aconiti, gr. ʒ.
 „ Opii, gr. ʒ.
 „ Hyoscyami, gr. ʒ.
 „ Conii, gr. j.
 Glycyrrhizæ pulvis, ʒ, s.
 For one pill.

According to circumstances, I have given, without producing any great disturbance, three, four, and even five of such pills in a day, and, sometimes, in about eight or ten hours. It is evident, that it would not have been so, had the toxic effects of each of these extracts been added to those of the others. There must be, therefore, some influence exerted by some of these substances upon the others diminishing their bad, and not their good, effects.

The association of remedies which are known to be more or less antagonistic to each other, as regards their bad effects in large doses when employed alone, has been very little studied. Great advantages may be obtained by such associations, if the favorable effects of the associated remedies remain entire or nearly so, and still more if, as seems to be the case for the bromides of potassium and of ammonium, these effects are then increased. Only a few physicians seem to have paid attention to the question of association of remedies. Mialhe, in his ingenious work on the action of remedies,¹ has studied the question in its chemical aspect, which is but a very small part of it. I know but very few original

¹ *Chimie appliquée à la Physiol. et à la Thérapeut.* 1856, p. 554.

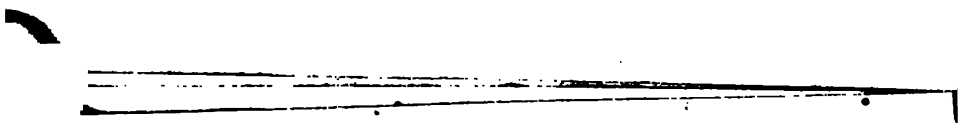
papers on this subject, in which its importance is duly appreciated. Two of them are well worthy of mention: one is by Dr. Eisenmann, of Würzburg,¹ and treats of the influence of association of opium with many other remedies; and the other, by Dr. Nivison, of Hector, N.Y.,² on the association of opium, also, with quinine. In the treatment of neuroses, researches on this subject would well repay those who would undertake them.

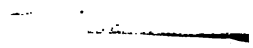
¹ Bulletin général de Thérapeutique, vol. LVII. Juillet, 1859, pp. 26 et 81.

² American Journal of the Medical Sciences, July, 1861, p. 51.

ERRATUM.

Page 88, third line in the last paragraph, instead of "bad effects in large doses when employed alone," read "bad effects when employed in large doses."





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